

FLIGHT

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AND AIRSHIPS

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A Milestone

THE annual reviews of the British aircraft industry in *Flight* are like milestones on the path of aeronautical progress. A study of the machines depicted and described in any one year gives a good idea of the trend of thought and practice in this country. Now and again a type appears which embodies some novel or revolutionary ideas, and this occurs more often in the case of aircraft than of most other machinery, because aeronautics is still a very young science. Startling novelties, however, cannot be expected every year.

The machines, air craft, and engines described in this special issue—which, incidentally, will form a valuable work of reference—show steady progress. Types which have been familiar for some years past are still undergoing improvements which give better performance at less cost in some respect or other. Refinements to proved types often give more satisfactory results than can be hoped from plunges into the unknown; though, of course, novel designs are always welcome and deserving of careful consideration. Our tried and trusted aircraft of to-day were once novelties themselves.

At this moment the designers of our aircraft firms are far from barren of novel ideas. On the contrary, the drawing offices are simply alive with new designs, each of which will, it is hoped, solve some problem of speed or economy or fighting ability. We need only mention the Short-Mayo composite aircraft as a proof of this. The expansion of the Royal Air Force has stimulated invention, and the Air Ministry has ordered new types, some of which still exist only on the drawing-boards. That this should be done shows what an exact science aircraft design has now become, and what confidence the Air Ministry is able to repose in the aircraft firms. For obvious reasons it is not possible for many of these new types to be illustrated in this issue.

This issue, in fact, puts on record a stage of high aeronautical achievement, even though the present standards are destined to be surpassed by new aircraft now on the point of spreading their wings.

Shutting the Stable Door

ON the page of this issue devoted to Royal Air Force affairs it is notified that the Air Ministry is about to alter the form of the monthly *Air Force List*.

On the face of it that seems quite a good thing to do, for it is a publication which is not exactly the simplest of books of reference, though when its intricacies have been mastered it is certainly full of useful information.

There has, however, been one recent change in this publication which cannot be approved. Up to the issue of September last the *Air Force List* published the station of each squadron and also the type of aircraft with which it is equipped. In the October issue the type of aircraft was omitted, and the omission, we understand, is to be made permanent. No reason for the change has been given, but the speculation is probably not far wrong that the idea is to prevent information falling into the hands of foreigners.

A Futile Step

If so, there can be no hesitation in saying that the step is utterly futile. The Air Ministry must have a very poor idea of the intelligence and abilities of foreign agents if they imagine that they can prevent them from finding out the equipment of a squadron by simply refraining from publishing it. Nothing could be easier than for an agent to drive past any aerodrome on any fine day, when he would obtain all the information he wanted. It must be presumed, of course, that any agent worthy of his hire knows the difference between a Fury and a Bulldog when he sees them.

What would be easy for any paid agent must be much more difficult for any loyal subject who wants to take an intelligent interest in the squadrons of the Royal Air Force. In these days of expansion and recruiting it is very desirable that every Briton should take such an interest. This step is merely hiding from the British public what cannot be hidden from foreigners, and that sort of secrecy is foolish, useless, and even harmful. It recalls a day some years ago when Press representatives

went to inspect a new machine and the publicity manager of the constructors gave out some information with the remark: "That is all we are allowed to tell you, but you will find all the rest in (naming a certain foreign paper) of such-and-such a date."

Most Government departments are liable to periodical attacks of secrecy fever, but it is a futile proceeding to dash round in a panic shutting the doors of empty stables. The effect is merely irritating to loyal subjects.

Commercial Bombers

AN Air Ministry representative spoke up the other day at a sitting of the Royal Commission on the Private Manufacture of and Trading in Arms, and disagreed with the suggestion that a commercial aeroplane could be fitted with bomb-dropping apparatus within eight hours. The exact number of hours which such an operation would take is of minor importance, but it is a very good thing to see some official protest being made now and again against the statement so often repeated by the uninformed, and so little comprehended by the generality of people, that every civil aeroplane can easily be made into an efficient bomber.

Of course, if the Disarmament Commission were to

succeed in abolishing all air forces, then every civil and commercial aeroplane would become a potential bomber of greater or less efficiency. The ordinary private touring machine, provided that it had the range to reach enemy territory and return, could carry a few bombs, which might be dropped overboard by hand, as was done in the early days of the war by the R.F.C. But to supplement an established and trained air force to any extent which would be worth while by the conversion of civil aircraft would be quite another matter. Such machines would have to run the gauntlet of an organised air defence, for which they would not be well equipped.

Then there is the question of defence for the converted bomber. It would not be at all a simple matter to arrange gunners' cockpits in a civil machine so as to provide a good field of fire. A bombing formation by day relies entirely on cross-fire to enable it to fight its way through the defensive fighters to its objective. Even in the case of machines expressly designed as bombers, any one which falls out of the formation becomes an easy prey to the fighters. A night bomber relies more on the darkness than on its guns to get through to its objective, but its crew would not be the happier or the more confident for the knowledge that if attacked they could not count much on their machine guns.



SETTING THE PACE : A welcome stranger, the new Hawker monoplane fighter, being taken for an early test flight by Flt. Lt. P. W. S. Bulman. Powered with a Merlin, the latest liquid-cooled Vee-twelve Rolls-Royce, it uses almost every modern aid to performance. This *Flight* photograph indicates how carefully its designer, Mr. S. Camm, and his colleagues have considered aerodynamic cleanliness in order to reap the fullest advantage of the immense power output. Doubtless the Merlin does not "over-rev" in attaining the magic 300 m.p.h. mentioned in Parliament by Sir Philip Sasson. Other photographs appear on pages 612 and 613.

The Outlook

A Running Commentary on Air Topics

One Step Farther

WITH the first test flights of the new Hawker interceptor monoplane, of which, for the first time, photographs may be published (see pages 566, 612 and 613), a new milestone has been set up on the road of progress. For fairly obvious reasons it is not possible to quote actual performance figures, but some idea of the qualities of the new machine may be formed from the fact that the speed range is rather better than 5:1. The purpose of any aircraft is to fly as fast as possible, and in the interests of safety it should land as slowly as possible. Speed range is, therefore, a very fair criterion of efficiency, and in this respect the new Hawker monoplane has set a standard difficult to beat, except with an Autogiro.

Speed is not, of course, the only thing that counts, and efficiency of controls is of the very greatest importance. In this respect also the new machine seems to have lived up to Hawker tradition, Mr. Bulman having expressed himself as pleased with the way the aeroplane handles both at high speed and at low.

A retractable undercarriage and the use of split trailing edge wing flaps have played their share in the remarkable performance. So far the flight tests have been made with a fixed pitch wooden airscrew, but even with this the take-off is something to be marvelled at. The explanation may be found to some extent in the new Rolls-Royce Merlin engine, which gives a greater power output than has ever before been available in a single-seater British fighter. The combination certainly promises to place Great Britain well in the lead in single-seater fighters, and it must be remembered that the flight tests have only just begun, and that with development an even better performance may be expected.

One cannot help wondering what the effect on air tactics of a machine of this type is likely to be. Obviously the days of the "dog fight" will soon be over. At speeds such as the new Hawker achieves, it will no longer be possible for a pilot to throw it about. If he did, he would very soon "black out."

Delivering the Goods

EVERYONE connected with or interested in aviation will offer hearty congratulations to the United States in general and to Pan American Airways in particular on the successful completion of the first mail-carrying flight from California to the Philippine Islands—to the Glenn Martin company, which produced the *China Clipper*, and to pilot Musick and his crew. November 29 deserves to go down in history as one of the red-letter days of aviation, on which the first mails were landed at Manila after being carried all the way by air.

The flight was undertaken with becoming sobriety. Here was no attempt at a spectacular "stunt," but a serious commercial undertaking, making use of the ground

organisation laid down beforehand, and taking plenty of time, as is shown by the fact that the crossing took one week by the calendar, although one day was lost owing to the crossing of the international date line about half-way between Midway Island and Wake Island. That day will be regained on the return flight.

Doubtless the *China Clipper* could have cut a day off the schedule, had it been thought worth while to do so. For the new schedules planned by Imperial Airways a similar caution is being observed, a week being allowed for a certain flight which the machines could, if necessary, complete in four-five days. In that way regularity of arrival can be guaranteed, and in serious commercial work this is of greater value than an occasional spectacular flight in exceptionally short time.

While congratulating our American friends, we look forward to the day when British air mails go direct by flying boat to Australia and South Africa. The welcome will be as hearty as that accorded the *China Clipper*.

Australia and Foreign Aircraft

A SMALL thunderbolt has fallen in the shape of news that the Australian Government has decided to allow direct importation of American and German aircraft under licences from the Civil Aviation Department. For years past there has been a party in Australia which has believed that Australian air lines would thrive better if they were able to use American

machines, but the heavy import duty made it impossible for them to do so. Moreover, all Government mail contracts stipulated the use of British machines and engines. It seems that the Australian operators were impressed by the great speed which the circumstances of American internal air transport have forced upon the designers. It is not at all certain that this speed is economic, even inside America, and it may be still less economic in another country. One always has to pay for speed, and the question is whether in each special case the return justifies the outlay.

One report from Sydney says that Holyman's Air Lines, who run a service Sydney-Melbourne-Tasmania, are importing Douglas machines to take the place of the D.H.86's which they have been using. That line has lost two 86's, which disappeared into the Bass Strait for reasons unknown, and naturally those tragedies have had an adverse effect on passenger bookings. Still, there are at present thirty-five D.H.86's at work in various parts of the world, and sixteen more are now on order.

The Minister of Defence, Mr. Parkhill, is reported to have said that the decision was influenced by the R.A.F. expansion programme having held up deliveries of commercial machines for Australia. We cannot discover any instance in which this has taken place. He also said that the decision would be reviewed after a time. Perhaps it is not a bad thing that Australian operators should have a chance of trying out American designs for themselves.

ABOUT OURSELVES

THIS special issue of *Flight* forms a complete guide to the activities of the British aircraft industry. Aeroplanes, engines and components are exhaustively dealt with, and the issue will be found to form an exceedingly useful work of reference. The various sections comprising it have been arranged with this end in view.

In spite of the large amount of space devoted to these sectionised reviews, the greatly increased size of the issue has made it possible to include features typical of normal issues of *Flight*, such as the informative semi-technical articles by H. F. King, one of which will be found on pages 598-600. Nor have the regular features been sacrificed: the Commercial Aviation, Private Flying and Royal Air Force sections, together with "The Four Winds" news page and "The Outlook" commentary, appear as usual.

Flight this week sets up a new record in size, and the issue will penetrate to every corner of the globe to the general benefit of the growing British aircraft industry.



*An Aero Show in the Pages of "Flight":
The Products of Over 200 Firms:
Our Versatile Constructors*

WITH the present issue *Flight* presents to its readers what is, in effect, a British Aero Show. Not since 1929 has the British aircraft industry collectively shown to the world a full range of its products. Individual companies have exhibited at shows abroad from time to time, and what these exhibits have lacked in quantity they have amply made up for in quality, but however useful they have been in demonstrating the excellence of British design and workmanship, they have not, obviously, been able to give the complete picture of the whole industry, which is the main purpose of a British aero show.

For various reasons the British aircraft industry has not thought it advisable this year to stage, at Olympia or elsewhere, an actual aero show, and next year two are being held abroad, one in Stockholm in May and the other in Paris in November-December. That being so, the industry has decided that a British aero show in 1936 would be rather superfluous, a decision which we regret. When, however, *Flight* announced its intention of publishing a special issue dealing with the products of all the firms which contribute in some form or other to the design and construction of the aircraft and engines the industry responded in a manner which has enabled us to place before our readers a very complete review of British aviation products.

Some idea of the magnitude which the British aircraft industry has attained may be formed if it is pointed out that in the present issue *Flight* deals with the products of considerably more than two hundred firms.

Aircraft manufacturing companies now number 26, and between them they produce something like 80 different types, civil and military. It would be difficult to find better proof of the versatility of British aircraft firms than that supplied by the fact that 17 of these firms produce

about 40 different types of aircraft, ranging from small 20 h.p. machines to 40-seater air liners with a total horsepower exceeding 2,000 b.h.p.

In military aviation an equally gratifying variety is found. Between them, the fifteen aircraft firms which design and build military aircraft produce no less than 38 different types; and it should be remembered, in this connection, that even this number does not represent the real number of types, owing to the fact that almost every aircraft firm in the country is at present engaged upon the design and construction of new types about which nothing may be published.

When we come to aero engines, the number of manufacturing firms is, of course, somewhat smaller, but in spite of this the British aircraft designer has available a remarkable range of power plants, be his requirements an engine of 20 h.p. or so for an ultra-light plane or one of nearly 1,000 b.h.p. for a military or commercial type. It may come as a surprise to find that there are now no fewer than fourteen firms producing aero engines, and that between them they supply the designer with thirty-five main types.

To facilitate reference, the aircraft have been grouped under civil and military types, the data relating to the individual machines being collected in classified tables. Within each group, the products of different firms have been described alphabetically. As far as possible each type of aircraft has been illustrated, mostly by *Flight* photographs. In the engine section an alphabetical arrangement has been followed throughout, this being the logical arrangement as many of the engine types are equally applicable to civil and military aircraft types.

The final section deals with materials, components and accessories. Here again classification has been adopted in order to facilitate reference to any particular class of product.

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CIVIL AIRCRAFT

*Current Types Reviewed : Wide Variety of
Choice : 20-2,000 h.p. Models Available*

THAT very nearly forty different types of civil aircraft, not counting sub-types showing minor variations only, are produced by the British aircraft industry may possibly cause some surprise to those who have not followed very closely the development of civil flying during the last few years. Such is, however, the case, and in the following pages a review of most of these types is given, illustrated by photographs of the different makers' products. As readers are assumed to be interested in being able to refer readily to the types manufactured by any one company, this review has been so arranged that the manufacturers follow each other in alphabetical order.

Data, such as dimensions, areas, weights and performance figures have been grouped in table on pp. 574-575. To facilitate comparisons between different makes of aircraft of any particular class, the machines have been grouped in the table broadly according to class. In this way a reader who has found in the tabulated data an aircraft of any given class which interests him can refer to the brief description under the corresponding manufacturer's name.

CARDEN-BAYNES

COLLABORATION between Mr. L. E. Baynes, designer of the well-known Scud glider, and Sir John V. Carden, Bart., has resulted in the production of two types of ultra-light aeroplanes: the Carden-Baynes Auxiliary and the improved Pou-du-Ciel.

The Carden-Baynes Auxiliary is a high-efficiency sail-

plane of the familiar high-aspect ratio tapered-wing type, with the pilot seated in the nose of the fuselage. Built into the fuselage just aft of the wing is a hinged mounting for a small Villiers two-stroke motor cycle engine. This engine can be retracted into the fuselage when the sailplane has reached a region of strong up-currents, and the pilot can then enjoy gliding in absolute silence. The price is £250.

So much has been written lately of the Pou-du-Ciel that it will suffice if we remind our readers that the Carden-Baynes Pou is a factory-built version, fitted with the 30 h.p.



(Above) Two high-speed low-wing monoplanes, the Miles Falcon Six and the Airspeed Courier. Below is a Short Scion.





The smaller type of commercial aeroplane is represented by the D.H. Rapide on the left and the Airspeed Envoy below. The Miles Merlin shown in the lowest of these three pictures is in a lighter class, being a 4-5 seater.

Carden water-cooled engine. The latest type has a top speed of more than 70 m.p.h. The machine can be bought complete, or in parts for amateur assembly. The price of the "Pou," ready to fly, is £165.

AIRSPEED

AMONG the younger British aircraft firms, Airspeed (1934), Ltd., of the Airport, Portsmouth, of which Mr. N. S. Norway and Mr. A. H. Tiltman are joint managing directors, was among the first to introduce such modern aids to performance as retractable undercarriages. Two main types are in production at present, and others are expected shortly.

The Airspeed Courier is a single-engined low-wing cantilever monoplane, mainly of wood construction. Two alternative models are available, the English model having a Siddeley Lynx engine of 223 h.p., while the overseas model has the 278 h.p. Siddeley Cheetah Mark V. Both are fast for their power, the top speeds being 153 m.p.h. and 165 m.p.h. respectively. Seating accommodation varies according to the range required, the usual being for pilot and five passengers in each case.

Two alternative models of the twin-engined Envoy are also available, the overseas having Lynx engines and the English two Wolseley A.R.9 Mark I engines of 180 h.p. each. Again the number of passengers varies according to range, but both models are usually six-seaters or eight-seaters. Clean aerodynamic design and a retractable undercarriage result in a very good performance for a modest expenditure of power. The Envoy, like the Courier, is mainly of wood construction.

B.A.C.

ORIGINALLY founded by the late Mr. Lowe Wylde, B.A.C. (1935) Ltd., now have their headquarters at the London Air Park, Hanworth, Feltham, Middlesex. The managing director is Mr. Robert Kronfeld, the famous Austrian glider pilot, with whom are associated Lord Sempill and Mr. E. C. Gordon England.

Developed from the Lowe Wylde Drone, the so-called Super-Drone is a very light strut-braced monoplane, fitted with a Douglas flat-twin engine of 750 c.c. capacity. The machine, which is mainly of wood construction, is a single-seater, the



pilot sitting in front, while the engine is behind and above the wing. The excellent view obtained and the ease with which the machine can be flown make it particularly suitable for amateur flying. The landing speed is only 22 m.p.h., while the cruising speed is 60 m.p.h. Owing to the small size of engine, the running costs are remarkably low. The price of the Super-Drone is £275, fully equipped.

BOULTON PAUL

FORMED as an entirely separate company a little more than a year ago, with Mr. J. D. North and Mr. S. W. Hiscocks as joint managing directors, Boulton Paul Aircraft, Ltd., of Norwich, Norfolk, took over the aircraft section of the old-established firm, Boulton and Paul, Ltd. The firm is busy on military aircraft, but has also found time to produce civil types, one of which is described below.

The Boulton Paul P.71A was built to the order of Imperial Airways, Ltd., for use as a feeder line type, and may be said to have been developed from the Boulton and Paul Mailplane. The machine is a biplane of all-metal construction, with two Siddeley Jaguar VI A engines mounted under the leading edge of the top plane. The lower wing is set very low over the ground so that the wheel supports are quite short. Their drag is further reduced by streamline fairings. As used by Imperial Airways, the machine has accommodation for six or seven passengers and a large quantity of mail and luggage. Alternative accommodation for up to fourteen passengers can be arranged. The cruising speed is approximately 150 m.p.h.

BRITISH AIRCRAFT

USUALLY abbreviated to B.A. when coupled with the name of an aircraft type, the full title of this firm, of which Mr. Charles Best is managing director, is British Aircraft Manufacturing Co., Ltd. The offices and works are at Hanworth Aerodrome, Victoria Road, Feltham, Middlesex. At the present moment two aeroplane types are in production, both intended for the private owner.

The B.A. Swallow is a small open two-seater light plane,



The Spartan Cruiser is an all-metal three-engined monoplane with seats for six passengers and pilot.

The Saro Cloud shown here has two Napier Rapier engines. It is also available with two Siddeley Servals.

fitted with the 80 h.p. Pobjoy Cataract engine, or as an alternative, with the 70 h.p. British Salmson. The machine is particularly easy to fly, and lands at 25-30 m.p.h. The price, with Pobjoy engine, is £725.

Slightly larger, and more powerful, the B.A. Eagle is a three-seater cabin monoplane with retractable undercarriage. The machine is mainly of wood construction, and a feature of the cabin is the split top longeron which enables the whole top of the cabin to open in two halves, thus affording unrestricted access and exit.

Comfortable seating accommodation is provided for pilot and two passengers, the pilot sitting in front and the two passengers side by side behind him. Dual flying controls are fitted, so that the machine may be flown from the back seat if desired. The second set of controls is detachable. A large luggage compartment (11 cu. ft.) is provided behind the passengers' seat. When fitted with the 130 h.p. Gipsy Major engine the B.A. Eagle has a cruising speed of 130 m.p.h. The price is £1,250.



DE HAVILLAND

WHEN Capt. G. de Havilland formed his own company shortly after the war, he was joined by many of those who had worked with him at the old Airco. Thus D.H. technical tradition really dates back to 1914 or so, or even to pre-war days, when Capt. de Havilland was a designer at the Royal Aircraft Establishment, as it then was.

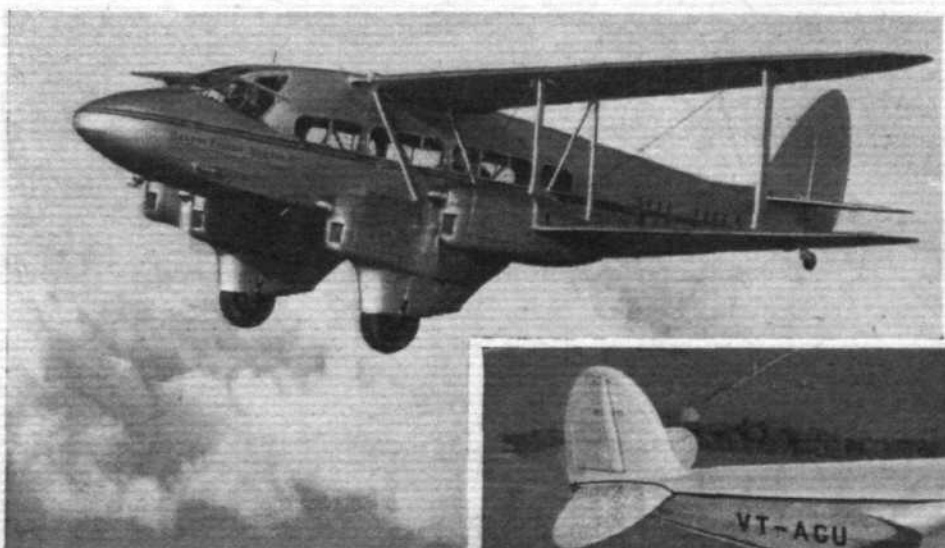
At the new De Havilland factory at Hatfield, Hertfordshire, a very wide range of civil aircraft types is produced, the firm having for many years specialised in civil rather than in military aviation.

The present De Havilland "style" may be said to have started with the Dragon, a twin-engined biplane fitted with two 130 h.p. Gipsy Major engines. By carrying a pay load of 1,300 lb. 109 miles in one hour on twelve gallons of petrol, the Dragon proved that unsubsidised commercial aviation was possible.

Next in size after the Dragon comes the D.H.89 or Rapide, which is a more "refined" machine in which is introduced

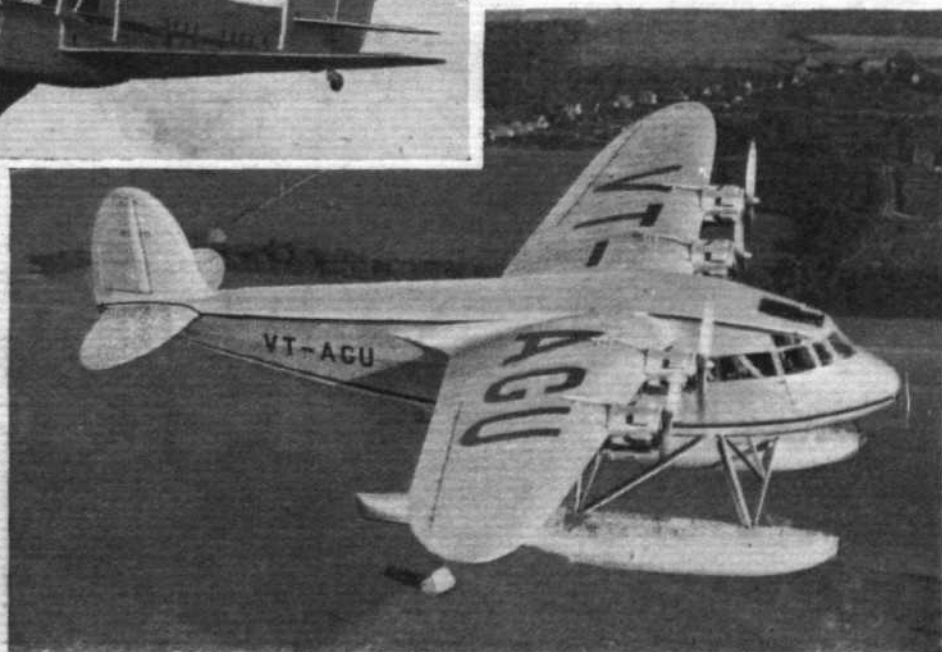
the tapered wings that have characterised De Havilland aircraft for some years. The performance is greater than that of the Dragon, partly due to the cleaner design and partly to the fitting of more powerful engines (two 200 h.p. Gipsy Six). Seating accommodation is according to requirements, and may vary from a very luxurious four-seater for the affluent private owner to a slightly crowded ten-seater arrangement for "ferry" services.

Originally designed for the Australia air route but since adopted in many other parts of the world, the D.H.86 Express air liner resembles the Rapide in its general lines, but is a larger machine and has four Gipsy Six engines abreast on the leading edge of the lower wings. The machine has been used very extensively, and the use of four engines has resulted in remarkable reliability as the machine is able to continue its flight with one engine stopped, and is even able to cover quite a respectable distance with two engines out of action. An improved version, known as the 86A., is announced for 1936. Among the improvements that will be available in the new



Designed originally for the Australia route, the De Havilland D.H. 86 shown on the left has become very popular on all classes of air line. The four engines give freedom from hurried forced landings

Another small four-engined type is the Short Scion Senior (right). The particular machine shown is a seaplane ordered for work in the East. A landplane version will be ready shortly.





Two large commercial types :
The Avro 642, on the left, is
also available as a twin-engined
machine ; below is the Handley
Page 42.

model is the fitting of controllable-pitch airscrews driven by Gipsy Six engines of greater power. The extra power will be obtained by increasing the compression ratio to 6-1. This will necessitate the use of fuel having a higher octane rating. The new model will have an operating speed of 155-160 m.p.h. at 7,000 ft. and a range of 748 miles with 190 gallons of fuel. Passenger accommodation will range from ten to sixteen, according to requirements.

Recently the company has put on the market a small two-seater biplane suitable for the private owner. Known as the Hornet Moth, this machine has side-by-side seating with dual controls, so that it can also, if desired, be used for school work. The machine is extremely comfortable and the view is remarkably good. With a 130 h.p. Gipsy Major the cruising speed is about 125 m.p.h. The price is £875.

Another private-owner type produced by the De Havilland company is the Leopard Moth, a strut-braced high-wing monoplane three-seater fitted with Gipsy Major engine. At a cruising speed of at least 120 m.p.h. the Leopard Moth has a range of 700 miles.

One should not conclude this brief review of De Havilland aircraft without a reference to the famous Comet which won the England-Australia race last year, piloted by Scott and Campbell Black. This machine incorporates some interesting structural features, such as a "double-diagonal" wood plank-ing of the monoplane wing. Aerodynamically, the Comet is probably one of the most efficient aeroplanes ever produced. Carrying pilot and one passenger, and with fuel for approximately 2,500 miles, the Comet cruises at 220 m.p.h. at 10,000 ft. In a paper which he read before the Royal Aeronautical Society shortly after the England-Australia race, Capt. de Havilland foreshadowed a "scaled-up" Comet with remarkable characteristics. That

The Avro 652 (right) is a fast type of small commercial aircraft. The Short Scipio shown below is used by Imperial Airways in the Mediterranean.

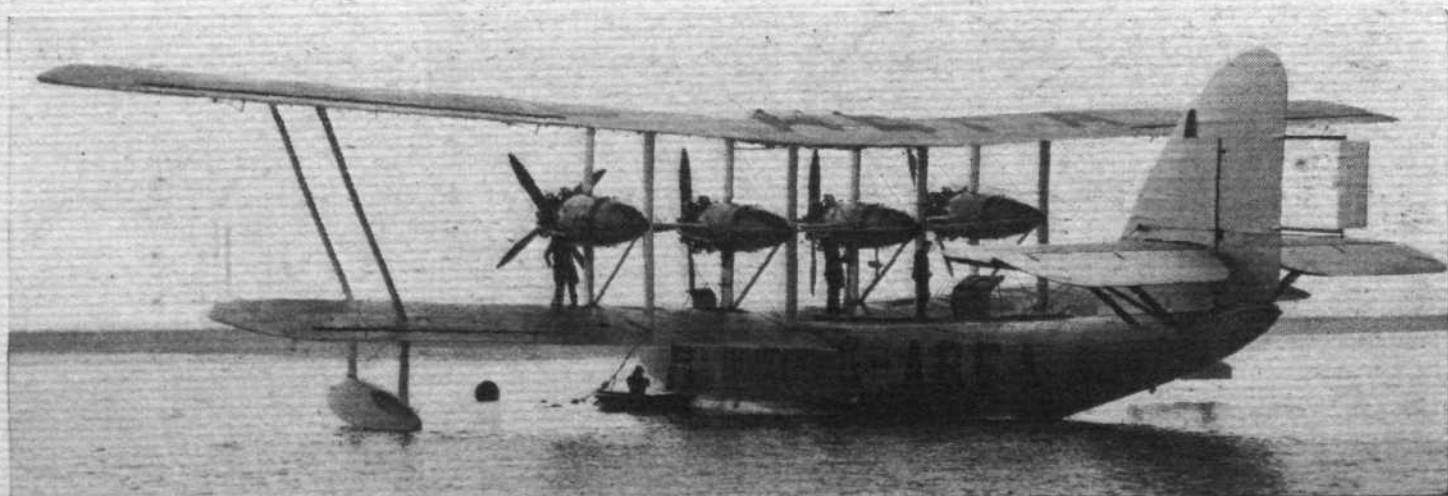
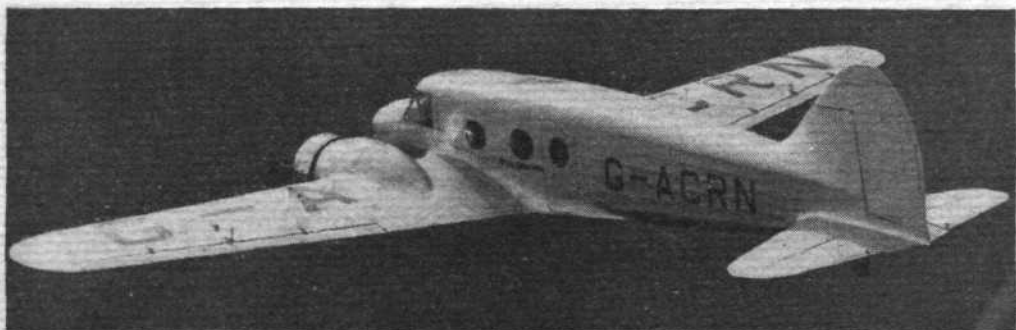


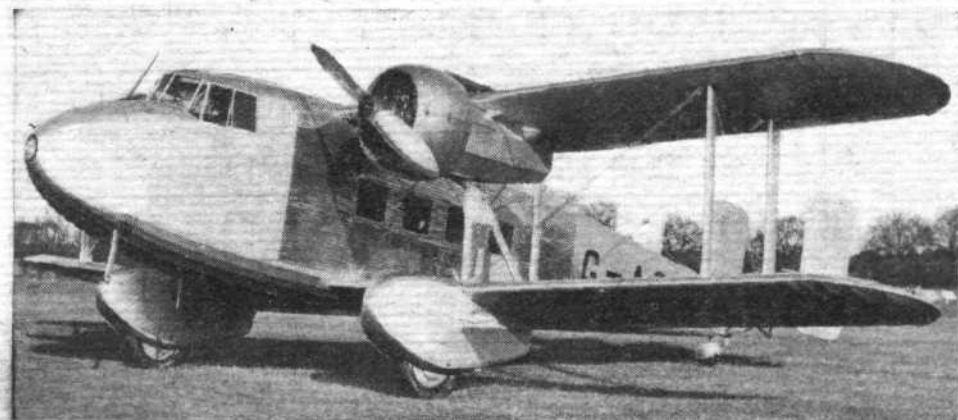
machine will be looked forward to with more than ordinary interest.

GENERAL AIRCRAFT

THE entry of Mr. H. J. Stieger into British aviation was made with an ingenious wing design in which a single spar was used in place of the more usual two-spar construction. Torsional strength was provided by two sets of bracing wires or tie rods, "wrapped around" the wing in opposite directions. The system has since been used in all the machines designed by Mr. Stieger, and has become generally known as the Mono-spar system of wing construction.

The latest type to be marketed by General Aircraft, Ltd., of Hanworth, Feltham, Middlesex, is the S.T.25 Jubilee. This machine has been developed from the successful S.T.10 which won the King's Cup air race last year, piloted by Mr. H. M. Schofield, a director and general manager of General Aircraft. The machine is of all-metal construction with the exception





The original version of the Bristol 142 (above) is a commercial type. A military version is now being built. On the left is the Boulton Paul P.71A, a small commercial type used by Imperial Airways.

of the fabric covering, and is a low-wing cantilever monoplane fitted with two 90 h.p. Pobjoy Niagara II engines. The machine carries pilot and four passengers at a cruising speed of 118 to 123 m.p.h. according to the degree of throttling. Among the very full equipment carried may be mentioned the "homing device" which enables the pilot to check his navigation by tuning-in on a broadcasting station. The price of the Jubilee is £1,750.

A still later type of aircraft built by this firm is the S.T.18. This machine is a commercial monoplane designed to carry ten passengers at very high cruising speed (approximately 170 m.p.h. at 13,000 ft.). An unusual feature of this machine is the pronounced "sweep-back" of the wings. This has been introduced in order to avoid sudden stalling. The S.T.18 is fitted with two 400 h.p. Pratt and Whitney Wasp Junior radial air-cooled engines. The undercarriage is, of course, retractable.

HESTON AIRCRAFT

ONE of the more recent British aircraft firms is the Heston Aircraft Co., Ltd., of Heston Airport, Hounslow, Middle-

sex. With Sir Norman J. Watson, Bart., as chairman, and Mr. B. R. S. Jones and Capt. G. A. Lingham as directors, this firm has recently introduced a very interesting five-seater monoplane suitable for the private owner, for taxi work, and for use on feeder lines. The machine, known as the Phoenix, is chiefly remarkable for the degree of comfort provided in its cabin. With pilot and four passengers there is ample room to stretch one's legs and rest one's elbows, and the noise level has been reduced to a degree comparable with that obtained in large air liners.

Although comfort was the main consideration, Mr. George Cornwall, the firm's chief designer, has managed to achieve a very good performance. For instance, the cruising speed is at least 125 m.p.h., which must be regarded as very good in view of the fact that the engine is a Gipsy Six of 200 h.p. only and five people are carried in a cabin with plenty of room. The generally clean aerodynamic design, the good shape of the fuselage, and the use of a retractable undercarriage have combined to make this possible. The price of the machine is £1,980.

HANDLEY PAGE

DURING the last five years or so a large proportion of the work of Imperial Airways, Ltd., has been done by the Handley Page Type 42, or Hannibal class, so called after the first of these machines to be produced in 1930. Handley Page, Ltd., of Cricklewood, London, have since 1917 or so been responsible for a long series of large aircraft, some military (Continued on page 576.)



A trio of small fast monoplanes. Above, on the left, the D.H. Leopard Moth, and, on the right, the Monospar Jubilee. On the left is the D.H. Comet.

BRITISH CIVIL AIRCRAFT TYPES

ULTRA-LIGHT AEROPLANES

Makers and Type.	No., H.P. and Type of Engine(s).	No. of seats.	Length ft. in.	Wing Span.	Folded Width.	Wheel Track.	Wing Area.	Tare Weight.	Fuel.	Oil.	Pilot.	Max. Gross Weight.	Max. Speed.	Cruising Speed.	Land- ing Speed.	Initial Rate of Climb.	Service Ceiling.	Range at Cruising Speed.	Take- off Run.	Land- ing Run.	Price.
								lb. kg.	lb. kg.	lb. kg.	lb. kg.	lb. kg.	m.p.h. km/h.	m.p.h. km/h.	m.p.h. km/h.	ft./min. m/min.	ft. m.	Miles. km.	Yards. m.	Yards. m.	£.
ABBOTT-SAYNES. Pon ...	1-30 Carden ...	1	13 0	22 0	—	3 8	140	350	30	5	165	559	70	60	30	300	—	200	100	20	105
			3 97	6 7	1 3	1 13	160	136	13 6	2 3	75	320	113	97	48	91	—	322	91	18	253
Auxiliary ...	1-50 c.c. Villiers ...	1	20 0	45 6	1 9	0 0	120	330	5	—	170	320	—	40	25	230	—	—	150	50	253
			7 0	13 9	0 53	0 0	112	150	2 3	—	77	230	—	65	40	70	—	—	137	45	253
B.A.C. (1935), LTD. Super Drone...	1-750 c.c. Douglas ...	1	21 2	30 8	10 0	4 6	172	309	50	10	100	640	68	60	22	380	12,500	300	45	45	275
			7 0	12 0	3 0	1 4	16	178	25	4	75	290	110	97	36	115	3,750	500	40	40	275
LIGHT AIRCRAFT, LTD. Astroca ...	1-40 J.A.P. ...	2	20 0	35 0	—	—	142	560	74	7	163	1,006	95	87	33	450	12,000	300	130	130	325
			6 4	10 9	—	—	132	259	34	3 2	74	455	153	150	53	157	3,660	483	118	110	325

PRIVATE OWNER AND FEEDER-LINE TYPES

BRIT. AIRCR. MFG. CO., LTD. Swallow ...	1-80 Cataract II ...	2	27 0	42 8	15 1	6 3	215	680	147	23	100	240	150	112	98	25	800	17,000	420	50	—	725
			8 2	13 0	4 6	1 9	200	422	67	10 5	73	709	73	180	157	40	40	540	670	46	—	1,950
Eagle ...	1-130 Gipsy Major ...	3	25 0	30 3	14 10	6 3	200	1,450	277	22	160	491	130	130	130	45	740	10,000	550	195	—	—
			7 9	12	4 5	1 9	186	658	126	9	73	224	208	239	208	72	213	4,830	1,040	178	—	—
DE HAVILLAND. Horner Moth ...	1-130 Gipsy Major ...	2	24 11	32 0	9 9	6 2	220	1,225	270	20	100	275	100	127	108	42	775	10,100	640	170	125	—
			7 6	9 9	2 9	1 9	205	556	122	9	73	125	885	203	174	68	236	4,910	1,030	155	114	—
Leopard Moth ...	1-130 Gipsy Major ...	3	24 6	37 6	12 10	6 9	205	1,405	270	20	160	370	130	138	117	50	625	14,500	895	215	140	—
			7 6	11 4	3 9	2 07	191	658	122	9	73	168	1010	222	188	80	150	4,420	1,120	195	128	—
GENERAL AIRCRAFT. S.T.25 Jubilee ...	2-90 Niagara II ...	5	26 4	40 2	14 10	11 0	217	1,750	286	39	100	640	100	—	120	54	700	14,000	540	195	120	1,750
			8 03	12 2	4 53	3 4	202	753	130	18	73	290	73	1300	193	87	273	4,200	840	178	110	—
HESTON AIRCRAFT CO. Phoenix ...	1-200 Gipsy Six ...	5	30 2	40 4	—	8 11	270	2,000	336	44	100	703	100	145	125	50	650	14,000	500	275	100	1,930
			9 2	12 3	—	2 72	25	968	152	20	73	347	73	233	200	80	290	4,300	800	250	145	—
PERCIVAL AIRCRAFT CO. Gull ...	1-130 Gipsy Major ...	3	24 11	30 2	13 2	6 7	169	1,200	305	20	160	515	160	154	134	44	950	18,000	745	210	110	—
			7 61	11 01	4 02	2 01	157	688	139	13 2	73	234	73	165	146	71	290	5,500	1,200	191	100	—
Gull ...	1-200 Gipsy Six ...	3	24 11	38 2	13 2	6 7	169	1,500	305	20	100	455	100	176	155	45	1,030	20,000	840	105	125	—
			7 61	11 01	4 02	2 01	157	688	139	13 2	73	234	73	165	146	71	290	5,500	1,200	191	100	—
Moss Gull ...	1-200 Gipsy Six ...	1	26 1	24 0	—	5 0	75	1,060	293	13 2	160	238	160	225	190	58	1,400	21,000	750	210	180	1,450
			7 32	7 32	—	1 52	75	1,060	293	13 2	160	238	160	225	190	58	1,400	21,000	750	210	180	1,450
Vega Gull ...	1-200 Gipsy Six ...	4	25 6	30 6	10 0	9 0	184	1,575	303	13 2	73	408	73	262	206	93	427	6,400	1,208	191	164	—
			7 77	12 04	4 58	2 74	171	716	139	13 2	73	302	73	274	243	72	290	5,500	1,000	187	114	—
PHILLIPS AND POWIS. Sparrow Hawk ...	1-140 Gipsy Major ...	1-2	23 6	28 0	—	8 3	138	1,080	170	28	160	312	160	175	155	42	1,300	18,000	400	80	73	825
			7 05	8 5	—	2 5	128	480	77	12 5	73	142	73	175	155	42	1,300	18,000	400	80	73	825
Falcon ...	1-130 Gipsy Major ...	3-4	25 0	35 0	15 10	8 0	174	1,300	242	18	160	480	160	145	125	44	750	15,000	615	95	87	1,000
			7 62	10 7	4 82	2 44	162	690	170	8 2	73	218	73	233	201	71	229	4,522	990	110	100	1,000
Falcon Six ...	1-200 Gipsy Six ...	3	25 0	35 0	15 10	8 0	174	1,500	280	25	170	393	170	180	160	45	1,125	20,000	580	140	130	1,425
			7 62	10 7	4 82	2 44	162	690	170	8 2	73	218	73	233	201	71	229	4,522	990	110	100	1,000
Merlin ...	1-200 Gipsy Six ...	5	25 10	37 0	16 6	8 0	182	1,700	337	35	160	708	160	155	140	50	900	18,000	700	200	150	1,650
			7 92	11 3	5 06	2 41	169	711	180	16	73	321	73	188	164	80	274	4,586	1,126	220	200	1,650
Peregrine ...	2-200 Gipsy Six ...	7	32 0	46 0	—	—	300	3,200	—	—	—	—	—	—	—	—	1,100	—	—	201	183	—
			9 75	14 1	—	—	27 9	1,452	—	—	—	—	—	—	—	—	335	—	—	201	183	—
A. V. ROE & CO. Cadet...	1-150 Genet Major ...	2	24 9	30 0	—	—	262	1,286	200	24	190	370	190	116	100	43	700	12,000	325	—	—	—
			7 65	9 14	—	—	24 4	583	91	11	86	136	86	187	161	69	213	3,660	—	—	—	—

PRIVATE OWNER AND FEEDER-LINE TYPES—continued

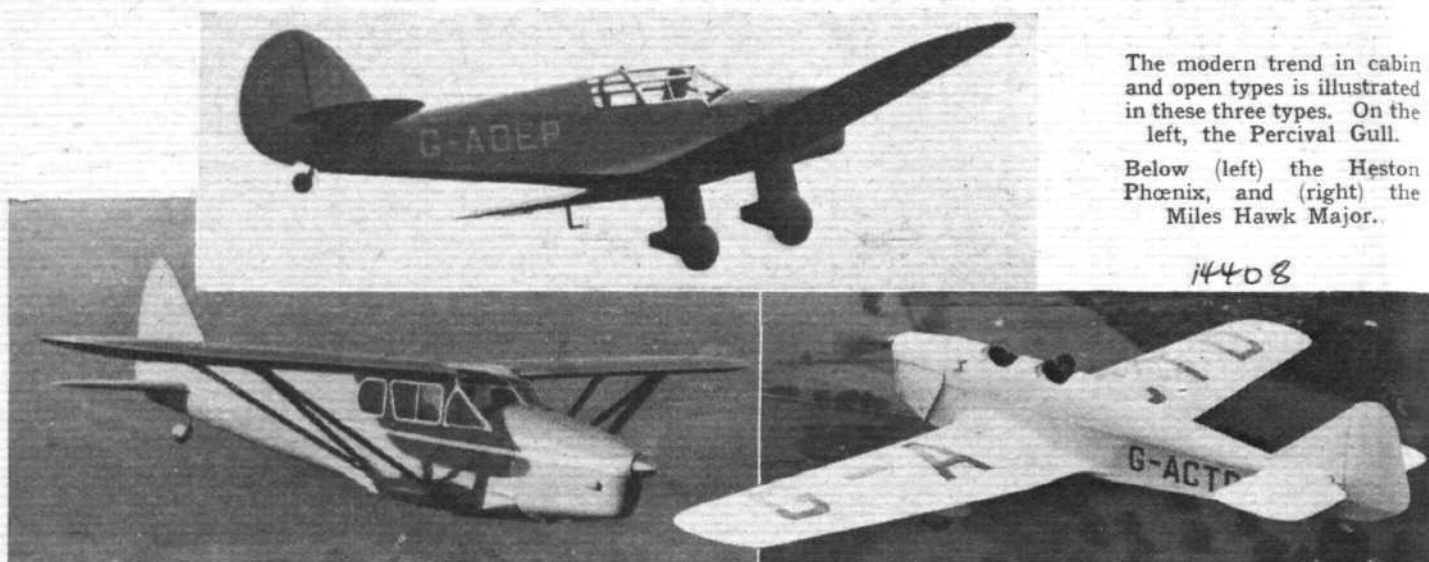
Makers and Type.	No., H.P. and Type of Engine(s).	No. of Seats.	Length o.a.	Wing Span.	Folded Width.	Wheel Track.	Wing Area.	Tare Weight.	Fuel.	Oil.	Pilot.	Pay Load.	Max. Gross Weight.	Max. Speed.	Cruising Speed.	Landing Speed.	Initial Rate of Climb.	Service Ceiling.	Range at Cruising Speed.	Take- off Run.	Landing Run.	Price.
			ft. in. m	ft. in. m	ft. in. m	ft. in. m	sq. ft. m ²	lb. kg	lb. kg	lb. kg	lb. kg	lb. kg	lb. kg	m.p.h. km/h	m.p.h. km/h	m.p.h. km/h	ft./min. m/min	ft. m	Miles. km	Yards. m	Yards. m	£
SAUNDERS-ROE. Cutty Sark (Amphibian) ...	2—130 Gipsy Major ...	4	34 4 10,5	45 0 13,7	—	10 0 3,05	320 26,4	2,670 1 229	400 181	50 22	170 77	560 254	3,850 1 744	103 166	85 137	55 89	550 168	9,000 2 740	340 548	180 167	—	—
SHORT BROTHERS. Scion ...	2—90 Niagara III ...	6-7	31 6 9,6	42 0 12,8	—	9 8 2,94	256 23,8	1,890 869	239 109	20 13	160 73	882 400	3,200 1 450	128 206	115 185	50 80	625 190	13,000 3 970	390 627	140 128	140 128	2,250

SMALL COMMERCIAL TYPES

AIRSPED, LTD. Courier ...	1—223 Lynx IV C ...	6	28 0 8,56	47 0 14,3	—	8 6 2,59	250 23,2	2,344 1 064	—	—	170 77	1,218 553	3,900 1 771	153 246	132 212	56 90	730 223	13,500 4 120	635 1 022	266 243	137 125	—
Envoy ...	2—223 Lynx IV C ...	6-8	34 6 10,5	52 4 15,9	—	12 5 3,78	339 31,5	3,780 1 699	—	—	170 77	—	5,850 2 650	174 280	153 246	64 103	1,070 324	16,500 5 020	650 1 045	270 247	240 219	—
BOULTON PAUL. P.71A ...	2—400 Jaguar ...	8-16	44 2 13,6	54 0 16,5	—	18 4 5,58	718 66,7	6,100 2 767	1,080 490	Incl. oil.	(2) 360 163	1,510 685	9,500 4 310	—	150 241	62 100	1,400 427	21,000 6 200	420 676	200 183	200 183	—
DE HAVILLAND. Dragon ...	2—130 Gipsy Major ...	5-10	34 6 10,5	47 0 14,3	25 4 7,72	12 0 3,69	376 35	2,535 1 152	462 210	44 20	170 77	1,289 584	4,500 2 043	128 206	109 175	60 96	612 187	12,500 3 810	545 878	275 254	180 166	—
Rapide (89) ...	2—200 Gipsy Six ...	5-10	34 6 10,5	48 0 14,6	—	11 6 3,5	340 31,6	3,220 1 462	585 266	68 31	170 77	1,157 534	5,200 2 360	157 253	133 214	62 100	950 290	17,900 5 460	578 930	230 228	230 210	—
85A ...	2—200 Gipsy Six (with V.P. airscrews).	10-14	46 1 14,1	64 6 19,7	—	12 11 3,94	602 55,9	6,850 3 110	1,463 664	155 70	(2) 340 154	2,192 996	11,000 4 994	165 265	160 275	63 101	1,025 313	17,100 5 215	748 1 203	—	—	—
A. V. ROE & CO. 632 ...	2—310 Cheetah IX ...	8	42 3 12,9	56 6 17,2	—	13 8 4,16	—	5,100 2 318	618 280	69 31	(2) 340 154	1,308 594	7,500 3 405	195 314	165 266	62 100	950 290	21,500 6 550	—	200 183	250 229	—
SAUNDERS-ROE. Cloud ...	2—340 Rapier ...	8	49 9 15,2	64 0 19,5	—	14 6 4,26	650 60,4	6,450 2 928	1,100 500	140 63	170 77	1,840 835	9,700 4 403	121 194	102 164	60 97	800 244	15,000 4 590	408 656	200 184	—	—
Cloud ...	2—340 Serval ...	8	49 9 15,2	64 0 19,5	—	14 6 4,26	650 60,4	6,250 2 835	1,100 500	140 63	170 77	1,840 835	9,500 4 310	118 190	95 153	60 97	750 229	12,500 3 820	380 612	200 184	—	—
SHORT BROTHERS. Scion Senior ...	4—90 Niagara ...	11	42 0 12,8	55 0 16,8	—	11 9 3,5	400 37,2	3,652 1 656	462 210	77 35	170 77	1,400 638	5,750 2 610	140 225	122 196	55 88	725 222	12,000 3 660	420 675	—	—	—

LARGE COMMERCIAL TYPES

ARMSTRONG WHITWORTH. Atalanta ...	4—340 Serval ...	20	71 6 21,8	90 0 27,4	—	—	1,285 120	13,900 6 320	—	—	—	—	21,000 9 550	156 251	125 201	—	—	—	—	—	—	—
HANDLEY PAGE. 42 ...	4—555 Jupiter ...	40	80 9 27,4	130 0 39,6	—	—	—	—	—	—	—	9,000 4 080	30,000 13 650	127 204	95 153	52 83	760 232	—	—	—	—	—
A. V. ROE & CO. 642 ...	2—460 Jaguar ...	18	54 6 16,6	71 3 21,7	—	15 10 4,85	728 67,7	7,850 3 561	985 447	136 62	(2) 340 154	3,090 1 400	12,500 5 670	160 257	135 217	67 108	810 247	13,750 4 190	400 645	320 293	270 247	—
SHORT BROTHERS. Scipio ...	4—555 Jupiter ...	18	78 5 23,9	113 0 34,4	—	—	2,640 245	20,460 9 300	—	—	—	—	32,000 14 550	137 221	105 169	60 97	—	—	—	—	—	—
Scylla ...	4—555 Jupiter ...	42	86 3 27,3	113 0 34,4	—	—	2,615 243	—	—	—	—	—	32,000 14 550	137 221	105 169	60 97	—	—	—	—	—	—



The modern trend in cabin and open types is illustrated in these three types. On the left, the Percival Gull.

Below (left) the Heston Phoenix, and (right) the Miles Hawk Major.

14408

and some civil. Mr. F. Handley Page is one of the pioneers of British aviation, and of recent years his name has become known the world over for his invention of the so-called slot, a safety device which prevents an aeroplane from going into a spin.

The H.P.42 is a large four-engined biplane of all-metal construction, an unusual feature being the arrangement of the engines, two of which are placed close together on the leading edge of the upper wing, while the other two are mounted, farther outboard, on the lower wing. When this feature was first introduced it gave rise to certain misgivings, due to the high position of the thrust line of the upper engines. In practice, however, no trouble has been experienced due to this cause.

Two versions of the H.P.42 have been in service, known as the "Western" and "Eastern" respectively. The former has cabin accommodation for thirty-eight passengers, while the latter carries fewer passengers but has a greater flying range. The engines fitted are Bristol Jupiters of 555 h.p. each. The comfort in the cabins of the 42 is of a very high order, and passengers who use the air routes regularly speak highly of the steadiness and absence of noise. These qualities, rather than high performance, dominated the design when the machine was first produced. There is little doubt that, were the firm to be called upon to produce a large commercial type nowadays, a much higher performance could be provided without any lessening of comfort.

LIGHT AIRCRAFT

A VERY great step towards providing flying at really low cost has been taken by the formation recently of Light Aircraft, Ltd., a company of which the directors are Mr. B. J. Brady and Mr. J. V. Prestwich. The company's offices are at 7, Park Lane, London, W., and flying is done at Hanworth. This new company has secured the English rights for the little Aeronca two-seater monoplane, a type which originated in Canada, whence the first machines have been imported. In the near future, however, manufacture will begin in this country, and as the Aeronca engine is to be

manufactured by J. A. Prestwich, the makers of the well-known J.A.P. motor cycle engines, the machine will before long be built entirely by English labour and marketed by British capital. Moreover, a flying school is being started at which the pilot's "A" licence can be obtained for less than £20.

The Aeronca-Jap is a side-by-side two-seater monoplane with the cockpit totally enclosed by transparent windows and panels so that the view is equal to that obtained in an open aeroplane, but the occupants fly in comfort without being battered by the slipstream of the airscrew.

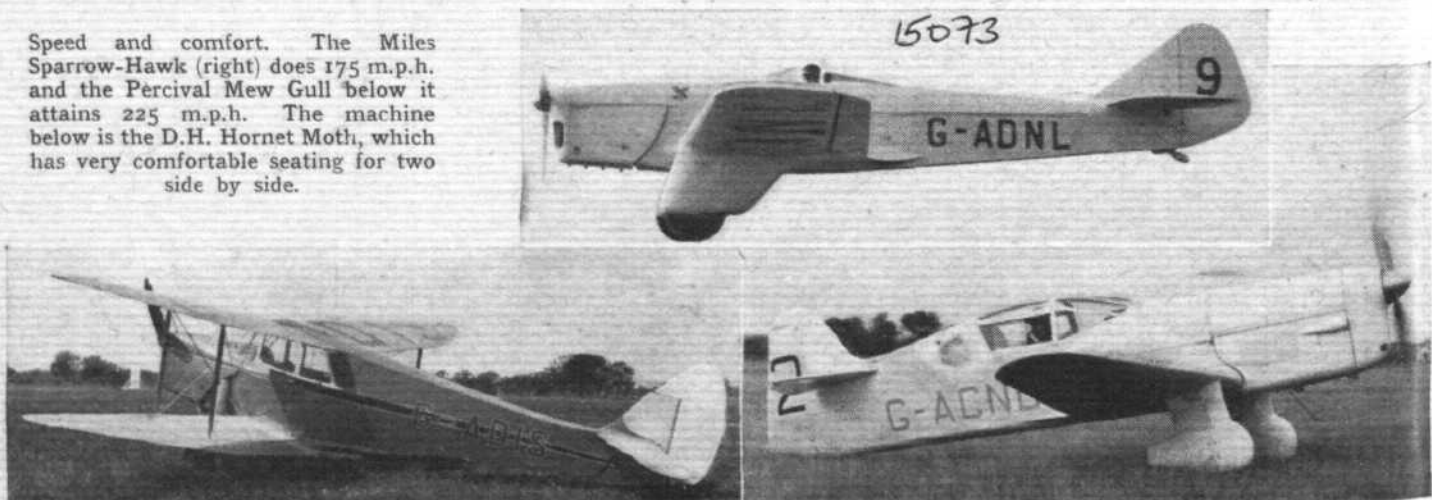
In general design the machine is a wire-braced high-wing monoplane of mixed construction with a fuselage of welded steel tubing covered with fabric. The wing has wooden spars and ribs, also fabric-covered. A very neat undercarriage is fitted. Each wheel is carried on a cantilever axle, the springing being provided at the end opposite the wheel, inside the fuselage covering.

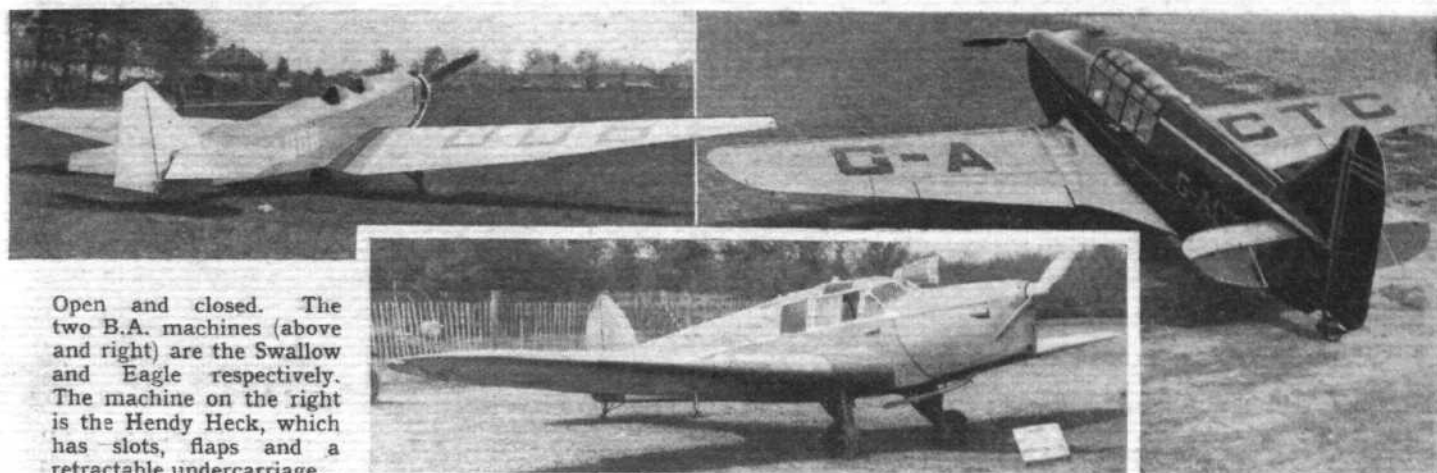
That the design is efficient is proved by the fact that the machine has a maximum speed of 95 m.p.h. although the flat-twin engine is of 40 h.p. only. A power expenditure of 20 h.p. per occupant is modest in the extreme, and not only enables the machine to be sold at the very low cost of £395 "ready to fly away," but results in very low running cost. For instance, cruising at 85 m.p.h. the cost of petrol and oil is approximately five shillings per hour, or less than a penny a mile for two people.

PARNALL AIRCRAFT

LAST May Parnall Aircraft, Ltd., was formed by a pooling of three firms, George Parnall and Co., the Hendy Aircraft Co., and Nash and Thompson, Ltd. The firm builds military as well as civil types. Best known of the latter is the Hendy Heck, a cabin two-seater low-wing monoplane in which full use is made of slots, flaps, retractable undercarriage, and other modern aids to performance. The result is a machine with an almost phenomenal speed range. The slots and flaps enable the machine to be landed at about 40 m.p.h., while the maximum speed, when fitted with a 200 h.p.

Speed and comfort. The Miles Sparrow-Hawk (right) does 175 m.p.h. and the Percival Mew Gull below it attains 225 m.p.h. The machine below is the D.H. Hornet Moth, which has very comfortable seating for two side by side.





Open and closed. The two B.A. machines (above and right) are the Swallow and Eagle respectively. The machine on the right is the Hendy Heck, which has slots, flaps and a retractable undercarriage.

De Havilland Gipsy Six engine, is 180 m.p.h. The cruising speed is about 165 m.p.h. It was on a machine of this type that recently Mr. David Llewellyn flew from Cape Town to Lympne, Folkestone, in 6 days 8 hours 27 minutes, a record for this journey. The sole concessionaires for the Hendy Heck are Aircraft Exchange and Mart, Ltd., of 7, Park Lane, London, W.

At present Parnall Aircraft, Ltd., are going ahead with a batch of Hecks, some of which will have the Gipsy Six, while others will be fitted with the Wolseley Aries engine. The production model will have a very roomy cabin for pilot and two passengers. There are also rumours of a sort of Super-Heck coming along, which may possibly be fitted with a moderately supercharged Siddeley Cheetah engine.

PERCIVAL AIRCRAFT

CAPT. E. W. PERCIVAL came to this country from Australia a few years ago, and without losing any time he established himself as an aircraft designer and constructor. To such good purpose did he work that his firm, the Percival Aircraft Co., of 20, Grosvenor Place, London, S.W.1, is now very busy supplying light aircraft to many quarters of the globe. Capt. Percival has ever been a believer in good performance, and all his machines are designed to have a good cruising speed without, however, sacrificing comfort. In this year's King's Cup race the Percival Gulls performed with remarkable consistency, but their handicap allowances prevented them from winning. Capt. Percival himself secured sixth place in the race, and his was the fastest machine, averaging no less than 211 m.p.h. around the course.

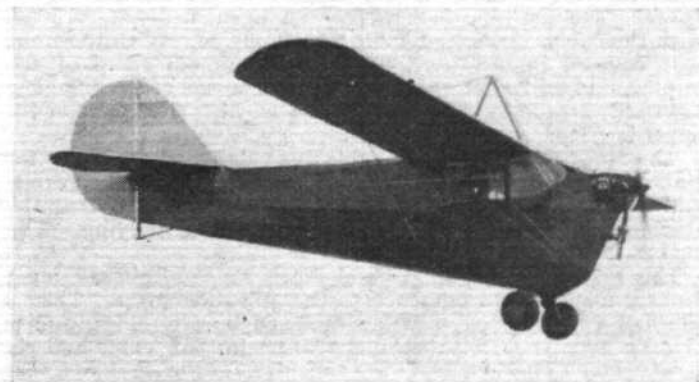
It is the Gull which has made Percival's name known all over the world. The Gull is a low-wing cantilever monoplane of all-wood construction, with seating accommodation for pilot and two passengers. Various engines can be fitted, such as the De Havilland Gipsy Major, Gipsy Six and the Napier Javelin. With the Major the machine cruises at 134 m.p.h., and with the Six at 155 m.p.h. A very effective flap gear has been designed by Capt. Percival. It is operated by a simple lever like that of a motor car hand brake.



The Autogiro C.30, which cannot stall and which lands without any forward run in a very small space. Built by A. V. Roe & Co.

The Percival Vega Gull may be regarded as a 1936 model, the first of the type being in course of construction. It is a four-seater cabin monoplane generally similar to the Gull, but with a wider fuselage to give ample seating accommodation for four people. The engine is to be the 200 h.p. Gipsy Six and the estimated cruising speed is 150 m.p.h.

Fastest of the Percival "family," the Mew Gull is a tiny cabin single-seater with Gipsy Six engine. The pilot is situated very far back in the fuselage, and the shape of the cabin roof is such as to offer but little head resistance. The maximum



Economical flying is provided by the Light Aircraft Co.'s Aeronca, which carries pilot and passenger on an engine of 40 h.p. only.

speed of the machine is 225 m.p.h., and it cruises comfortably at 190 m.p.h.

PHILLIPS AND POWIS

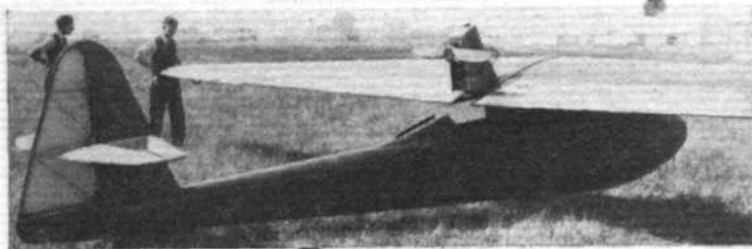
THIS year's race for the King's Cup served to attract attention to the qualities of the aeroplanes designed by Mr. F. G. Miles, and built by Phillips and Powis Aircraft, Ltd., of Woodley Aerodrome, Reading, Berks. Three Miles machines secured first, second and third place, the race being won by Mr. "Tommy" Rose in a Falcon Six, at an average speed of 178 m.p.h.

All Miles-designed Phillips and Powis aeroplanes so far produced have been all-wood low-wing cantilever monoplanes with "trousered" undercarriages. There is a strong family resemblance between the different models, so that it is usually easy to identify them wherever they are seen.

Space will permit of a brief reference only to the many models now produced at the Reading factory. Mr. Charles Powis, managing director of the firm, believes in a progressive policy, and under his guidance a remarkable series of types has recently been introduced.

The Miles Falcon is a three-four-seater intended for the private owner or for light feeder line work. The normal accommodation is for pilot and two passengers, but at slightly less comfort a third passenger can be carried. With a 130 h.p. Gipsy Major engine the cruising speed is 125 m.p.h. The price of the machine is £1,000. Trailing edge flaps can be fitted at an extra cost of £60.

A speed version of the Falcon is the Falcon Six, which is a very comfortable three-seater, with the pilot in front and the two passengers side-by-side behind him. The engine is a 200 h.p. Gipsy Six, with which the cruising speed is 160 m.p.h. The price is £1,425. Hydraulic flaps £60 extra.



The Abbott-Baynes Auxiliary glider has a retractable engine.



The B.A.C. Super Drone is an ultra light pusher type, in which the pilot has a very excellent view.



The famous "Pou-du-Ciel." This particular machine is Mr. Appleby's, which has a top speed of more than 70 m.p.h.

Slightly larger than the Falcon, the Miles Merlin is a five-seater, one passenger sitting next to the pilot and the other three side-by-side behind. With Gipsy Six engine the cruising speed is 140 m.p.h., and the range 700 miles. The price of £1,650 includes hydraulic flaps, but if a variable pitch airscrew is required this is supplied at extra cost.

Speed with economy is the keynote of the Miles Sparrowhawk. The machine is normally an open two-seater, fitted with the Gipsy Major high-compression engine. With the front seat covered in, the machine has a maximum speed of 180 m.p.h., and cruises at 155-160 m.p.h. The use of trailing edge flaps reduces the landing speed to 42 m.p.h. The price, with flaps, is £825.

The Miles Nighthawk is a cabin type designed especially for training. The cabin has side-by-side seating with dual controls, and a curtain shuts off the view of one occupant so that the machine can be used for training in instrument flying. The engine is a 200 h.p. Gipsy Six.

This review of the Phillips and Powis range of aircraft must be concluded with a reference to the Miles Peregrine. This is the first twin-engined machine designed by Mr. Miles, and is a cabin monoplane with accommodation for two pilots and six passengers. The machine is particularly suitable for feeder line work, or as a luxurious type for the private owner. When powered by two Gipsy Six engines, the Peregrine has a maximum speed of 188 m.p.h. and cruises at 164 m.p.h. Split trailing edge flaps give a steep angle of approach and non-critical landing.

A. V. ROE

IT is quite impossible in the space available in a special issue like the present to deal with all the different types of civil aircraft produced by A. V. Roe and Co., Ltd., of Newton Heath, Manchester. The firm is one of the oldest in the country and has produced literally dozens of types. Three or four will serve to illustrate the variety and range available.

The Avro Cadet is a small open two-seater training biplane, also suitable for the private owner who likes to enjoy to the full the fresh air and unrestricted view. The machine is a staggered biplane, fitted with the Siddeley 7-cyl. Genet Major engine of 150 h.p. The fuselage is a welded steel tube structure, while the wings are of wood. The maximum speed is about 116 m.p.h.

Another type of two-seater produced by A. V. Roe and Co. is the Cierva Autogiro, type C.30. The feature of this machine is, of course, the direct-control rotor, in which are incorporated all the flying controls, so that no elevators or rudders are fitted. There is no fixed wing, all the lift being obtained from the rotor. The cruising speed of this machine, when fitted with the Genet Major engine, is 95 m.p.h. and the landing speed is nil, as the machine can be brought down without forward run after touching. As the rotor blades continue to rotate when the machine is descending, stalling cannot occur.

A small, high-speed commercial type is the Avro 652, a low-wing monoplane with retractable undercarriage and seating accommodation for six passengers. When fitted with two Cheetah IX moderately supercharged engines the 652 has a cruising speed of 165 m.p.h. The fuselage is of welded steel construction and the wing of wood.

Considerably larger than the Avro 652 is the Avro 642, an air liner type of usual Avro construction. Designed to have passenger accommodation for 12-16 and a crew of two, the 642 is available with a wide choice of power plants, and is even supplied as a twin-engined and as a four-engined type, according to purchasers' requirements.

When fitted with two Siddeley Jaguars, the 642 has a cruising speed of 135 m.p.h. With four Lynx engines the cruising speed is 127 m.p.h. When two Panther engines are fitted the cruising speed goes up to 150 m.p.h., and with supercharged Panthers it is as high as 160 m.p.h. at the rated altitude.

SAUNDERS-ROE

SINCE taking over the old-established boat building firm of the late Mr. S. E. Saunders, of Cowes, Isle of Wight, some years ago, Sir Alliott Verdon-Roe and his old friend and partner, Mr. John Lord, have followed with success a very progressive flying boat policy and a number of types bearing the now familiar SARO denomination have made their appearance.

Among civil types of amphibian flying boats produced at the Cowes factory, mention can be made of two which have been in production for some considerable time. These two types are alike in their structural characteristics, i.e., an Alclad hull on which rests the all-wood monoplane wing. Two engines are mounted on trestles above the wing.

The Cutty Sark is a small four-seater flying boat, available also as an amphibian. The occupants are accommodated in two sets of seats, and being ahead of the wing they obtain an excellent view. When fitted with two 130 h.p. Gipsy Major engines and retractable land under-carriage, the cruising speed is 85 m.p.h. and the range 340 miles. As a plain flying boat the performance is slightly better and the useful load greater.

A larger version is the Cloud, which has been used extensively for flying boat training. As a commercial machine it has accommodation for eight passengers. Two alternative types of power plant have been standardised: the Siddeley Ser-pul and the Napier Rapier. With the former the cruising speed is 95 m.p.h. and the range 380 miles. With the two Rapiers the machine cruises at 102 m.p.h. and has a range of 408.

SHORT BROTHERS

ASSOCIATED with the earliest days of British aviation, the name Short Brothers has become famed the world over in connection with flying boats. Mr. Oswald Short, the only surviving brother, has always taken the long view, and his firm is now reaping the reward of his foresight in the form of very large orders.

During recent years Short Brothers, whose works are at Rochester, Kent, have turned their attention also to landplanes. The Short Scion is a six-seater transport monoplane, fitted with two 90 h.p. Pobjoy Niagara engines. In spite of the low power it has a good performance and is economical to operate. It is also available as a seaplane.

More recently a four-engined version, the Scion Senior, has been introduced. With the same type of power plant, but four Niagaras instead of two, the Senior is a larger machine and carries up to ten passengers.

The Short Scylla was produced some years ago for Imperial Airways and is a thirty-eight passenger landplane, having the same superstructure as the Short Kent or Scipio class of flying boat which has been in use in the Mediterranean for several years.

At present the Rochester works are busy on building a great number of large four-engined monoplane flying boats for Imperial Airways. Known as the Empire boat, this type will be very fast and will have remarkably comfortable passenger accommodation. Considerable height and relatively narrow beam will be features of the new boats.

Yet another type being built by Short Brothers is the Mayo Composite Aircraft. This consists of a large flying boat forming the lower unit and a smaller seaplane forming the upper. The boat helps to carry the upper unit to the operational height and then releases it. The upper unit is a long-range mail carrier with very high performance, having a range of more than 3,000 miles.

SPARTAN

THIS firm, although one of the younger among British aircraft manufacturers, has a strong link with the earliest days of British aviation in that Sir Alliott Verdon-Roe and Mr. John Lord are on the board of directors. The type which has become best known of recent years is the Spartan Cruiser, a small three-engined monoplane of the feeder line type.

Structurally, the Cruiser follows SARO flying boat practice in that the fuselage is built very like a flying boat hull, while the wing is of wood. The standard power plant of the Cruiser Mark III consists of three Gipsy Majors, one mounted in the nose of the fuselage and the other two in the leading edge of the wing. The machine can maintain height with any one of the three engines out of action, so that there is little risk of hurried forced landings. Seating accommodation is provided for up to eight people, and the cruising speed is in the neighbourhood of 115 m.p.h.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters intended for publication in these columns.

"CRASHPROOFING" THE PILOT

[3088]—A tidal wave of military monoplanes is obviously inevitable, judging from recent issues of *Flight*. The majority of these, it seems, will have low wings. Concurrently with the development of these machines designers are striving to improve the comfort of the crews—heating their cockpits with warm air and shielding them completely from the airstream. There seems to me to be one serious disadvantage of the low-wing type which must be overcome if pilots are to be completely at ease. In the event of such a machine overturning things will be decidedly uncomfortable for the occupants, and their plight will be aggravated by greenhouses and surrounding gear. Admittedly, the low-wing monoplane has become highly popular as a private owner's type, but in war-time operation, especially from confined spaces, a very much higher percentage of landing mishaps may be expected than in peace-time flying from specially prepared surfaces.

I note that the Vultee attack-bomber has a tripod inside its cockpit enclosure to protect the crew in such an emergency, and possibly the peculiar hump behind the cockpit of the little Boeing monoplane may contain some similar arrangement.

It is to be hoped that the safety of the crew will not be overlooked in the feverish search for performance now being made by British designers.

M. R.

London, E.5.

CIVIL AVIATION IN THE I.F.S.

[3089]—May I, as a constant reader of *Flight*, be permitted to correct one or two misguided ideas held by some people in this country as to the real reasons for the withholding of permission to operate for hire and reward in the Irish Free State by the Minister for Industry and Commerce? Some say the reason is because an operator is English, others say it is because he is perhaps politically against De Valera. In any case, most of the views I have heard are silly and are usually expressed by bitter opponents of Ireland.

Several attempts by various people in England have been made to gain a footing in the Irish Free State, and for the benefit of all concerned, now or in the future, it should be said that the conditions under which permission to fly for hire or reward in or out of that State are similar to the conditions which must, and have been, complied with in such Dominions as Australia, Canada and, if I am not mistaken, South Africa.

It does not matter two hoots whether intending operators are sympathetic or not to the present Government. Anyone putting his signature to any document there will be expected to carry out his promises to the letter and spirit.

Belfast.

"A" LICENCE.

THAT CYCLOGIRO

[3090]—Mr. Jubiagas' letter [3087] on a pedal Autogiro is quaint, but can hardly be serious, as the Autogiro is about the least efficient of all planes. There is something to admire in the two German lads who set out to win a nice prize if their object was just the fun of winning it and doing something new; but if anyone thinks there is the slightest practical use in attempting such things, he could better use his money in providing a small emergency landing ground for some possible lost pilot in a fog.

The high-efficiency glider is the nearest approach to pedalling there is, and if this type cannot be kept in the air without making one with no factor of safety at all, it is only suicide going up. The German lads did the only possible thing, and now they've had their photos in the papers there's nothing else to it.

While the pen is going, so to speak, I believe the primary glider is the quickest and cheapest method of getting the feel of things, and should advise all *Pou* beginners to have half a dozen or a dozen pull-offs. Sir John Carden's advice in your Correspondence columns was in every way good, and I was very pleased to read it.

P. PRIEST.

Huddersfield.

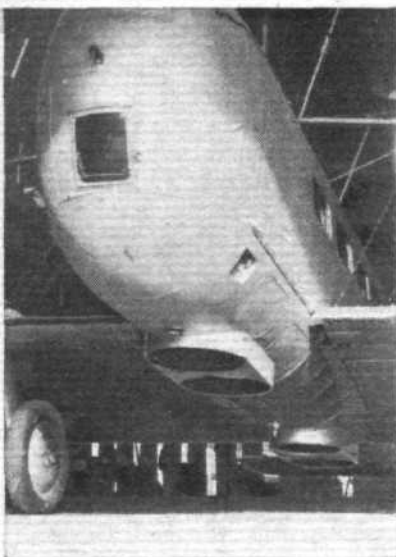
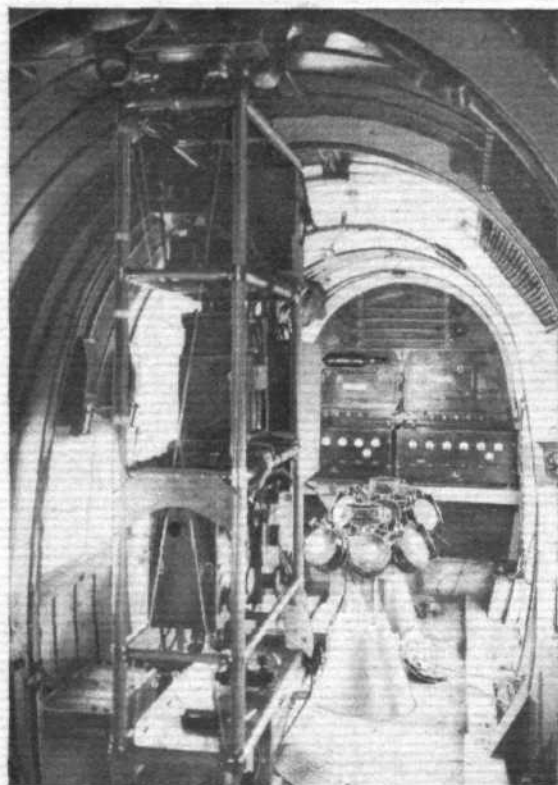
FOR HIGH-SPEED RESEARCH. The Miles Hawcon has been built specially for the Air Ministry in order to carry out high-speed research on thick wing sections. Wings of different thickness-chord ratios will be tested. The engine is a 200 h.p. Gipsy Six. (*Flight* photograph.)



121505

THE FOUR WINDS

ITEMS OF INTEREST FROM ALL QUARTERS



FOR DROPPING HINTS: To induce natives to conform to instructions, the R.A.F. has employed loud-speakers from the air. So successful has this system proved in Iraq that it is likely to be tried on the North-West Frontier and Somaliland. These views show an installation in a Vickers Valentia.

Variable Areas Again

It is reported from Rome that four engineers have designed and constructed a variable-area-wing machine.

Canadian Sharks

An order has been placed by the Canadian Government for a number of Blackburn Shark T.S.R. biplanes with Siddeley Tiger engines. The Shark is already a standard type in the R.A.F. and has also been adopted by the Portuguese Government.

Exonerated

The Boeing Aircraft Company, in a letter to *Flight*, states that, although the recent accident to their big 299 bomber was a terrific blow, they find solace in the report of the U.S. Army Air Corps board which investigated the crash and which indicated that there was no structural or functional failure on the part of the machine.

In Recognition of Resource

Capt. Glover, late chief instructor to the Southend Flying Club, and presently to be assistant instructor at the Airwork School, is to be presented with a gold watch by the Carnegie Hero Trust. It will be remembered that he rescued Mr. Denis Smith, the parachutist, from a more than perilous position. The latter's scarf caught in the bracing of the machine while he was already out on the wing, and Capt. Glover released him, held him over the front cockpit, and made a safe landing.

Back in Commission

The Latécoère flying boat *Lieutenant de Vaisseau Paris* has successfully completed its trials after repairs occasioned by a damaged wing. It is hoped that the boat will soon make a demonstration mail-carrying flight to the French West Indies.

South African Re-equipment

The first two Hawker Hartbeest machines ordered for the South African Air Force are already in use. Sixty more are to be built under licence in South Africa. The Hartbeest is yet another variation of the Hart design. Some of the South African machines are to have armour plating.

Alexandrian Activity

A large number of R.A.F. machines staged a mock attack on Alexandria last week. They were received, on behalf of the community, by "Archie."

Searching for Spots

Mr. Gandar Dower left Croydon by air recently for Kenya, where he hopes to secure a specimen of the extremely rare spotted lion.

Royal Interest at N.P.L.

During an informal visit to the National Physical Laboratory last week the Duke of Kent showed interest in the Aerodynamics Department, and subsequently witnessed, in the Engineering Department, demonstrations of various apparatus for testing the mechanical strength of materials.

Graf Zeppelin—Sky Squatter

On arrival at Pernambuco on its latest trip the *Graf Zeppelin* was prevented from "docking" by reports of fighting and of the occupation of the aerodrome by insurgents. The South American mails were dropped at Maceio and later 2 cwt. of fresh provisions were picked up from a Spanish steamer off the Brazilian coast. Eventually a landing was made after 119 hours in the air.

Twenty-five Years Ago

(From "Flight" of December 3, 1910.)

"Mr. Drexel's latest achievement should indeed take a bit of beating, according to a 'heading' in the *Bath Daily Chronicle*, which puts it at '5½ miles high' at Philadelphia last week. Curiously enough, the paragraph only mentions that the official height was 9,970 ft."



WHERE'S THAT AIRFLOW? "Dishing it out" and "taking it" are the two main jobs of the Vought Corsair and, for that matter, of any naval aeroplane. This particular Corsair is not, for the moment, engaged in dishing anything out.



BRITISH AERO ENGINES

*An Unparalleled Diversity of
Types : Still More Power for
Military Use*

It is fairly safe to say that a more diverse range of aero engines is available in this country than anywhere else in the world. The numerous licences acquired for the construction abroad of many types bear witness to their quality, to say nothing of the large batches which are continually being exported. Frequently British engines are specified for machines purchased by one Continental nation from another, and a recent European order for two American transports required the installation of power units made in this country.

The past year has seen a pronounced increase in output from standard engines, resulting from the use of high octane fuels and new materials and processes. Some interesting new units have been produced, chiefly in the low power class, catering for the present interest in ultra-light aircraft, and it is known that it will not be long before some completely new and extremely efficient units at the other end of the scale are in production.

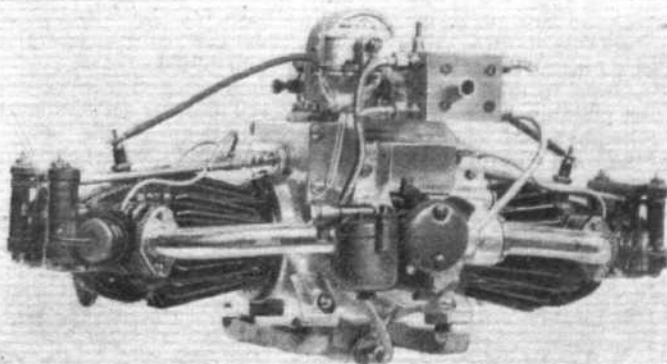
A.B.C.

IN 1912 the late Harry Hawker established a world's duration record in an A.B.C.-engined machine with a flight of 8 hr. 20 min. During the war the A.B.C. Company, whose present address is Walton-on-Thames, Surrey, produced no less than four types of engine for the Government, but since the termination of hostilities little work has been done on the aero engine side. With the development of the light aeroplane, however, attention was given to the design of a power plant suitable for installation in that type of machine. The result was the A.B.C. Scorpion, now produced in its Mk. II form, giving 34-40 h.p. It is a twin-cylinder horizontally opposed air-

cooled type and can be mounted either as a tractor or a pusher. The induction manifold is cast integral with the crank case and serves to heat the mixture and cool the oil. Cylinder heads are of cast iron and are bolted direct to the steel barrels, and two valves, operated through push rods, are fitted to each cylinder.

AERO ENGINES

AT their Kingswood (Bristol) works, Aero Engines, Ltd. intend to manufacture under licence certain engines of the Hispano Suiza range and the units which were, until quite recently, being developed by General Aircraft, Ltd.



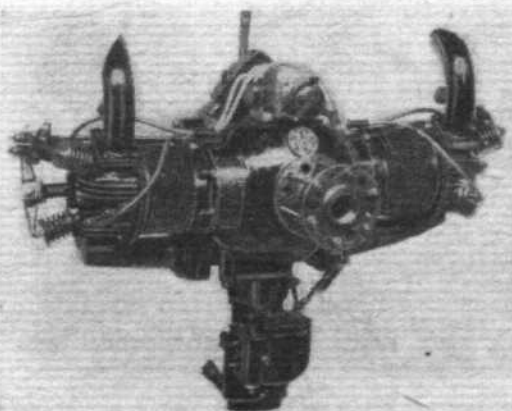
Unusual finning is a feature of the Aero Engines Mk. 1.

These latter are "Vee" type air-cooled engines. At the same time the Company is producing a small 750 c.c. engine known as the Mark I.

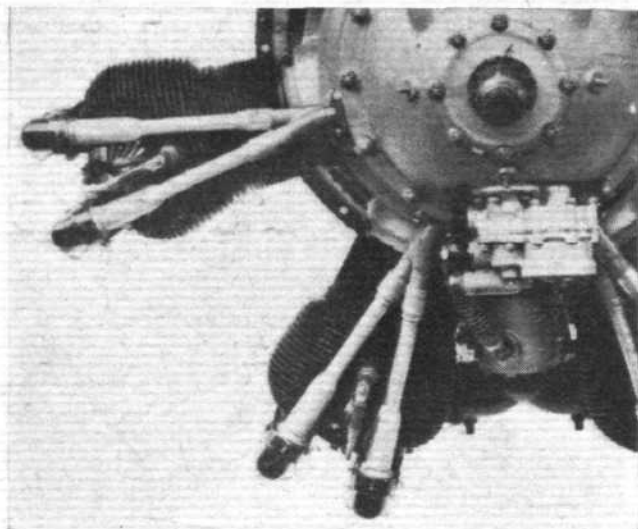
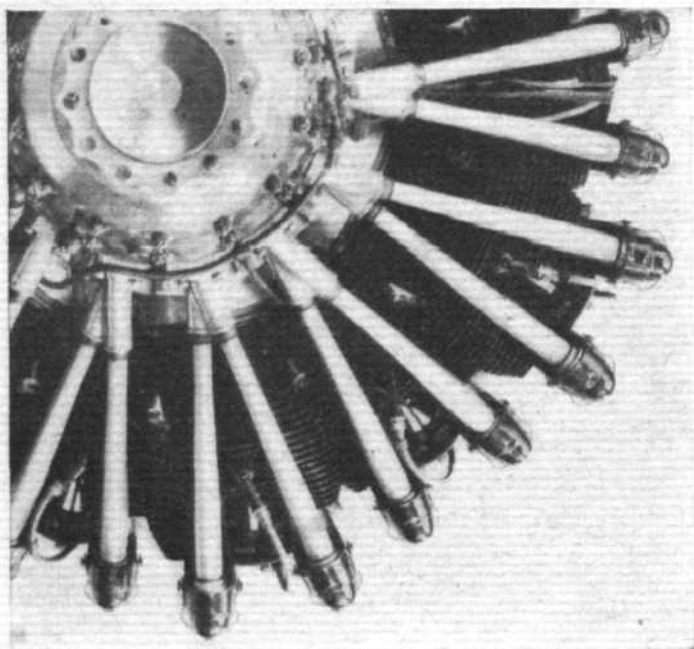
Of horizontally opposed twin-cylinder four-stroke air-cooled type the engine is suitable for installation in ultra-light aircraft. Its normal output is 21 h.p. at 3,000 r.p.m., but at 4,000 r.p.m. it gives a maximum of 26 h.p.

The cylinders are of cast iron and have detachable heads fitted with large ports. Aluminium alloy is used for the crank case and the steel connecting rods are hardened and ground at their big ends for roller bearing, and have duralumin small end bushes. Arrangements have been made for the alloy-steel crankshaft, which runs in ball bearings, to take the thrust in either direction.

Lubrication is on the dry sump principle, a duplex gear pump supplying oil to the crankshaft and returning it to the tank after circulation. A B.T.H. magneto with ignition advance control inter-connected with the throttle lever, a Zenith carburettor and an A.C. fuel pump are fitted as standard equipment.



The A.B.C. Scorpion gives 40 h.p. at maximum r.p.m.



The 14-cylinder two-row Siddeley Tiger VI (left) gives 840 h.p. for take-off. The 310 h.p. Cheetah IX (right) has seven cylinders and, like the Tiger VI, uses 87 octane fuel.

ARMSTRONG SIDDELEY

AN impressively complete series of aero engines is offered by Armstrong Siddeley Motors, Ltd., of Coventry. The units range from the Genet Major, rated at 150 h.p., to the Tiger VI, which develops 840 h.p. for take-off. Intermediate types which are proving highly popular are the Panther VII and IXa (560 h.p. and 600 h.p. respectively), the 340 h.p. Serval IIIB, the Cheetah IX of 310 h.p., and the 215 h.p. Lynx IVC. The range comprises seven-cylinder single-row types and ten and fourteen-cylinder double-row units. In the case of the latter engines the cylinders are staggered and the crankshaft is of the two-throw type with one connecting rod group to each bank of cylinders. The engines have many points in common, and, in the main, the following features apply to all:—

There are four standard sizes of cylinders, all consisting of a light alloy head, into which is screwed and shrunk a steel barrel, the two parts being secured by a locking ring, which also acts as a fin. All cylinders have two valves, operated through totally enclosed push rod and rocker gear.

In order to take full advantage of the increased compression ratios possible with 87 octane fuel, and bearing in mind the requirements of modern deep-chord cowlings, the Tiger, Panther and Cheetah engines are now fitted with an improved

type of cylinder head with deep, close fins and have sodium cooled exhaust valves.

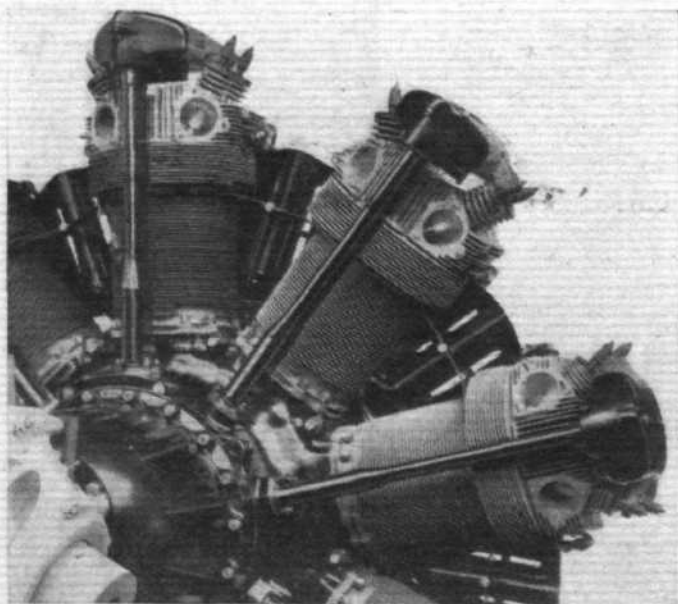
The one-piece high-tensile steel crankshaft is supported by roller bearings at its front and rear ends. In all cases the master rods are situated in the vertical cylinder. Where a reduction gear is fitted this is of the epicyclic type, housed in the front cover. The movement of the valves is obtained from a cam drum on the front of the engine. On the larger units the oil pump is enclosed between the crank case and the front cover, but the smaller types have a two-stage pump mounted externally below the front cover and driven by bevel gears from the crankshaft.

On the normally aspirated engines mixture is delivered by a fan driven at engine speed and mounted on the rear of the crankshaft. The medium supercharged type has a gear-driven fan running at approximately six times crankshaft speed, and the fully supercharged version varies from this type in that its shrouded rotor runs at approximately thirteen times crankshaft speed. All engines are fitted with Claudel Hobson carburettors, and in the case of the medium and fully supercharged engines a variable datum boost control is fitted to ensure that rated boost is not exceeded in flight, but which has an overriding device allowing maximum permissible boost for take-off and initial climb.

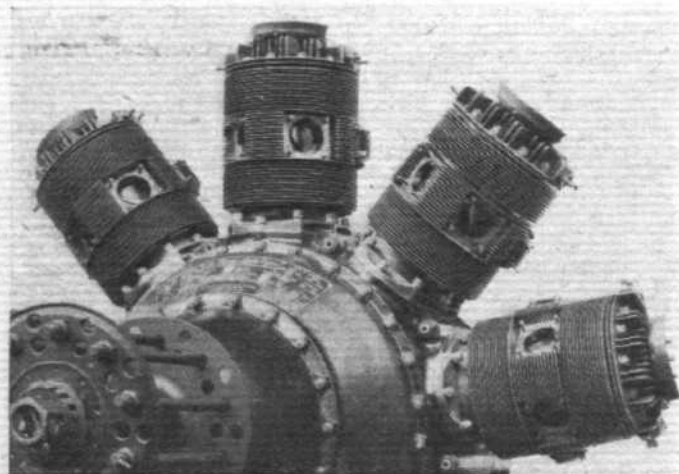
BRISTOL

HIGH-POWERED single-row radial engines are the speciality of the Engine Department of the Bristol Aeroplane Company, Ltd., whose works are at Filton, Bristol.

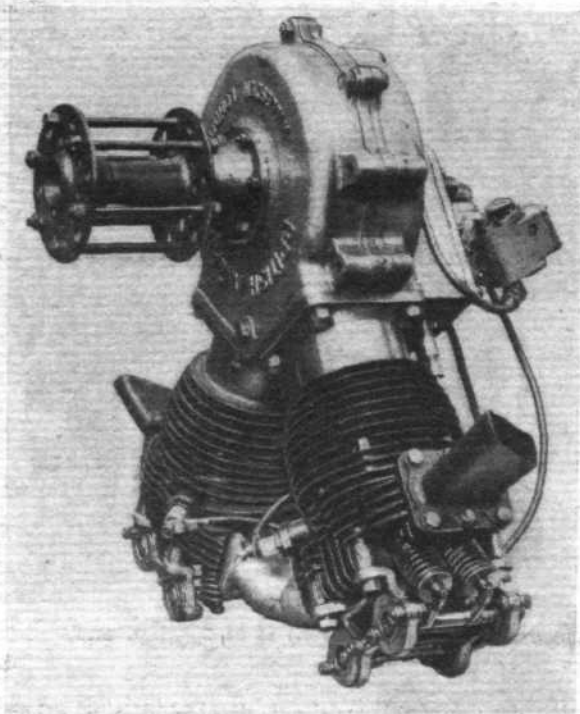
The current production programme includes, in addition to the 605 h.p. Mercury VI, 690 h.p. Pegasus III and 660 h.p. Pegasus IV (these engines are rated at 12,500ft., 3,500ft.,



The most powerful radial in production in Great Britain is the Bristol Pegasus X, which gives 920 h.p. for take-off. Note the inter-cylinder baffles and the hub of the C.P. airscrew.



The Bristol civil-rated Aquila gives 500 h.p. and is designed to run on fuel of 73 octane number. It is the first air-cooled sleeve valve engine to go into series production.

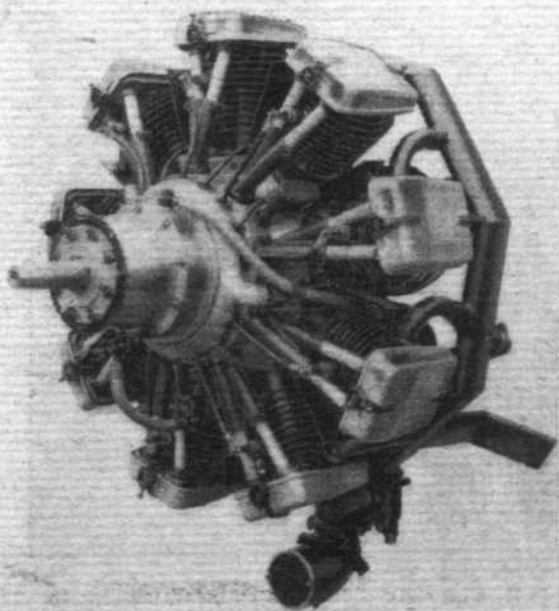


This is the direct drive version of the 34 h.p. British Anzani twin.

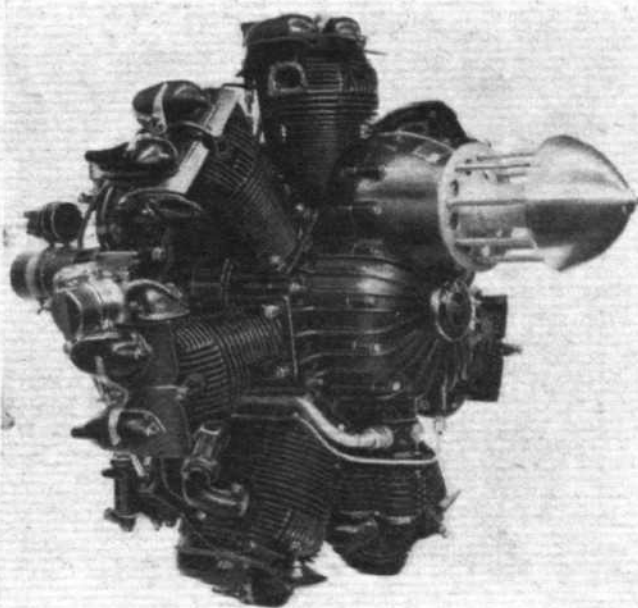
and 11,500ft. respectively), the Pegasus X, which delivers 820 h.p. at normal r.p.m. at 3,500ft. Actually, 920 h.p. is available for take-off and initial climb.

The Pegasus X may be regarded as a development of the Pegasus III. It is lighter, in spite of the increased power, and its more important features include a new design of cylinder head and barrel with a substantial increase in cooling area, sodium cooled and stellite exhaust valves and valve seats, hardened cylinder barrels, rubber buffer mounting, a choice of reduction gear ratios, long or short chord combined cowling and exhaust ring, a complete range of accessories, provision for auxiliary drives for special items, and facilities for the standardisation of a C.P. airscrew.

The higher output has been achieved by making the fullest possible use of 87 octane fuel, a greater degree of supercharging, and a higher crankshaft speed than in the Pegasus III. Weight has been reduced by refinement in the design of various components, the introduction of special steel of greater strength and improved durability and the use of magnesium castings.



Modifications now being made to the Salmson A.D.9R, which now gives 70 h.p., should result in an increase in power.

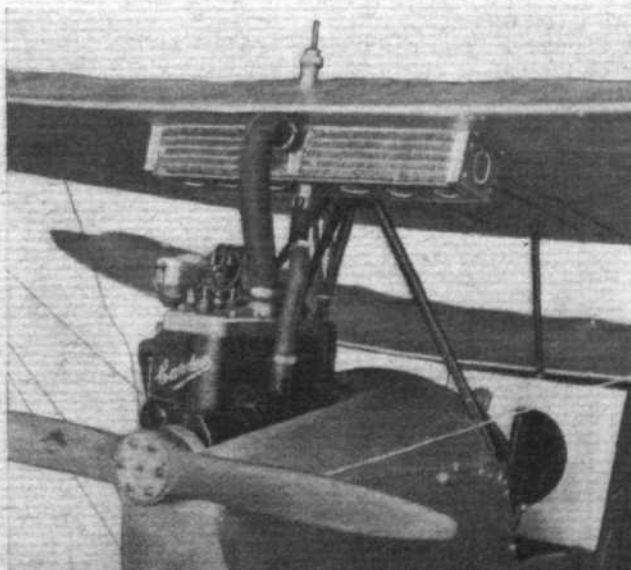


The 90 h.p. Pobjoy Niagara II is developed from the Mk. 1 Niagara installed in the 1934 King's Cup Race winner.

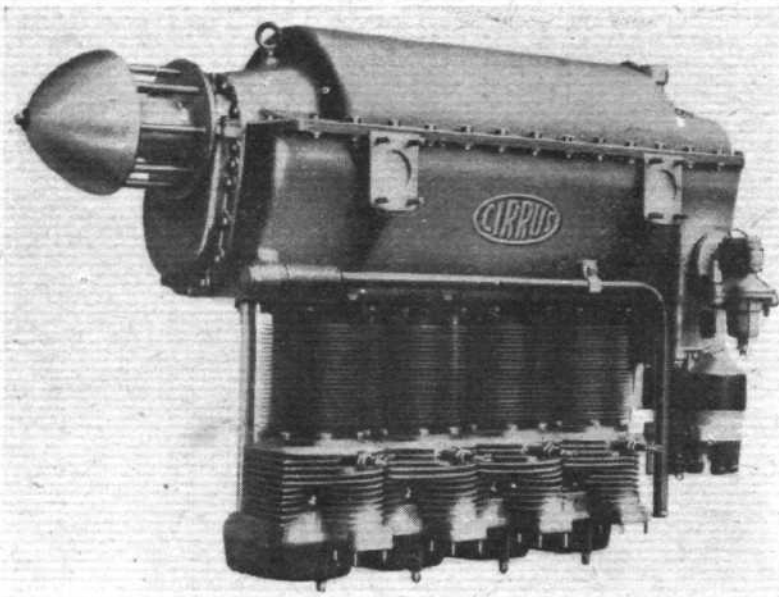
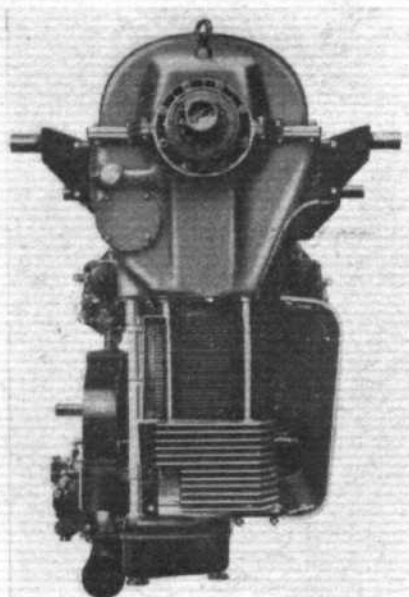
The connecting rod assembly, although of typical Bristol pattern, has been redesigned and strengthened. The solid master rod runs on a floating bush mounted on a hardened crank pin, the wrist pins and bushes are pressure lubricated and the crank pin and the big end bore are case-hardened. Of split type the crankshaft is carried on one ball and two roller bearings, and the crank pin is secured to the rear half of the shaft by the gripping action of a stout maneton bolt, in accordance with usual Bristol practice. The pistons are of the full skirted forged type, and the gudgeon pins are larger and stronger than before.

Some extremely fine development work is being done by the Bristol Company with sleeve-valve engines. One of these, the 500 h.p. civil-rated Aquila, which has a capacity of 960 cu. in., and is designed to run on 73 octane fuel, is the first air-cooled sleeve-valve engine to go into series production, and will be available for delivery early in the new year. A larger type, the Perseus, in its civil-rated form gives a maximum output of 770 h.p. and weighs 1,026lb.

For the past ten years the Company has been developing diesel engines for aircraft and the Phoenix unit in this category (415 h.p. at normal r.p.m.) installed in a Wapiti general purpose machine, was the means of bringing to this country the world's altitude record for diesel-powered air-



The newly introduced Carden has an aluminium cylinder head and dual ignition.



These are the two Cirrus-Hermes engines at present in production. The Major (left) is of 135 h.p. and the Minor (right) gives a maximum output of 80 h.p.

craft. The height homologated was 27,453ft. The Phoenix is not regarded as a production type engine.

BRITISH ANZANI

THE British Anzani Engineering Co., Ltd., of Kingston-on-Thames, in addition to making parts for all types and makes of aero engines, is turning out a small "Vee" twin type, giving 34 h.p. at 3,500 r.p.m., of its own design for installation in light aircraft. Its two air-cooled cylinders, which have a capacity of 1,100 c.c., are of close-grained iron and set at an angle of 57 deg. A built-up crankshaft is used, being counter-weighted and having specially lightened flywheels. Two inlet and two exhaust valves are provided in each cylinder, being operated by push-rods and double-arm rockers running in grease-retaining ball bearings. The crank case is of die-cast aluminium. Both direct drive and geared versions are available.

BRITISH SALMSON

TWO engines are in production at the moment at the Raynes Park works of British Salmson Aero Engines, Ltd. These are known as the A.D.9 (50 h.p.) and the A.D.9R. Series II, which gives 70 h.p.

Generally speaking, the two engines are similar, being nine-cylinder single row radials with overhead valves operated through push rods and tappets. One inlet and one exhaust valve are provided for each cylinder. Eight auxiliary rods are articulated to a master rod which has a solid white metal bearing.

A Claudel Hobson carburettor is fitted at the rear of the engine and dual ignition is provided, by two nine-cylinder magnetos. The airscrew is driven through a 2:1 reduction gear, the whole

of which is removable without disturbing any other part of the engine. Lubrication is on the dry sump principle. Another feature is the enclosure of the valve gear in oilproof boxes.

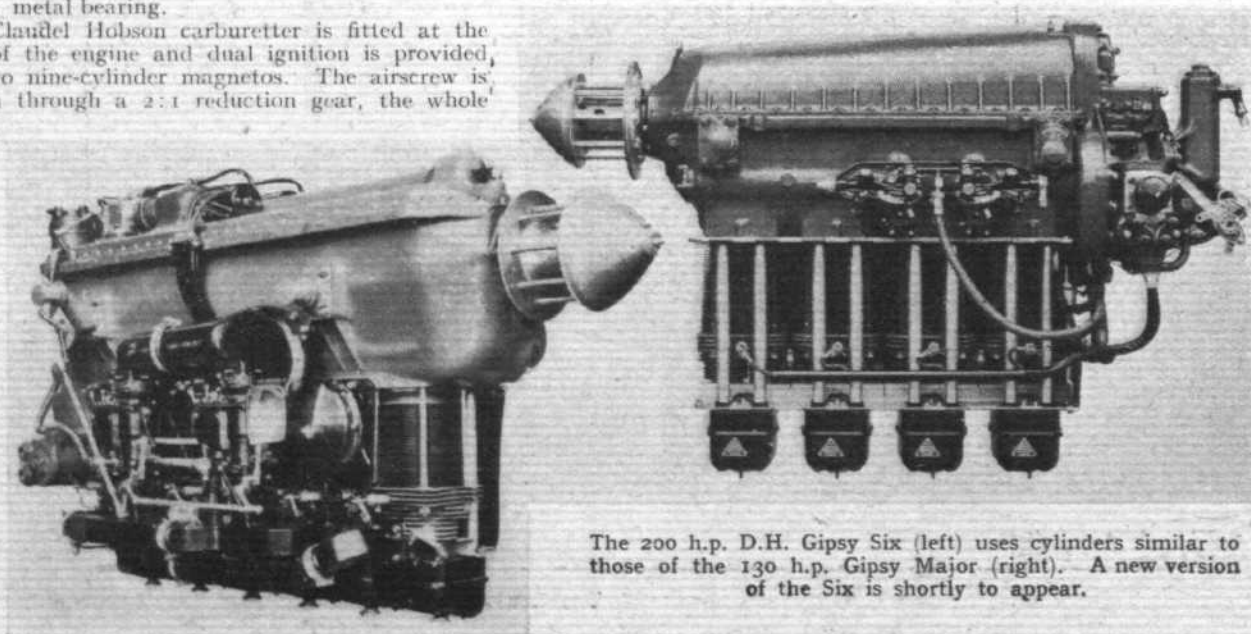
At the moment the A.D.9R. is undergoing certain modifications to the cylinders, which result in an increase in the horse power with a decrease in the engine r.p.m. A petrol pump will be fitted as standard equipment. It is hoped that this new version will have passed its type tests and be on the market by the beginning of the New Year.

CARDEN

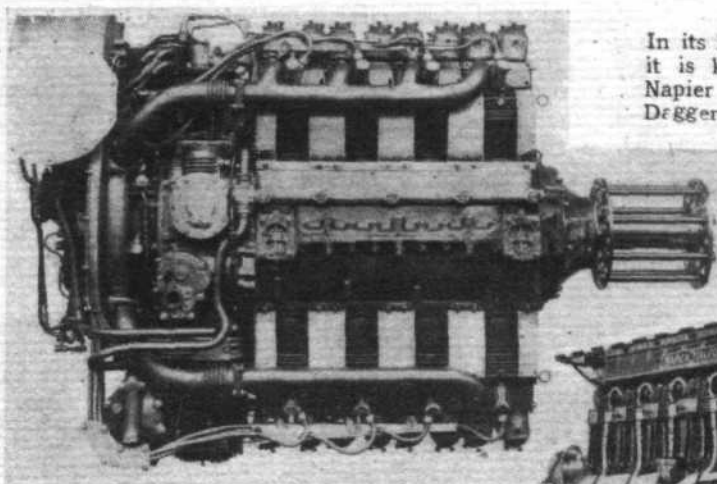
THE advent of the "Pou-du-Ciel" has led Carden Aero Engines, Ltd., of Heston, to put on the market a power unit suitable for use in this machine. It is based on a 10 h.p. car engine, but to suit it to aircraft work it has been fitted with an aluminium cylinder head, dual ignition, and certain other detail refinements.

CIRRUS

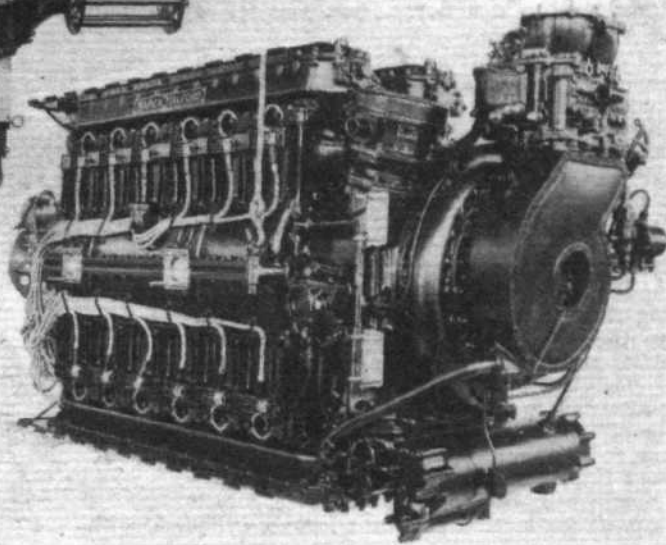
THE New Year should see the Cirrus-Hermes Engineering Co., Ltd., of Brough, Yorks, well into production on its Minor and Major engines. A number of Majors is already in use, and consequently the type is rather better known than the smaller unit. It may be recalled that it is an inverted in-line four-cylinder air-cooled unit giving 135 h.p. at 2,350 r.p.m., and weighing, complete, 310lb. The Minor has its



The 200 h.p. D.H. Gipsy Six (left) uses cylinders similar to those of the 130 h.p. Gipsy Major (right). A new version of the Six is shortly to appear.



In its latest moderately supercharged form, when it is known as the Series VI, the 14-cylinder Napier Rapiet (left) is rated at 360 h.p. The Dagger III (right) is a fully supercharged unit rated at 695 h.p. at 10,000 ft. A moderately supercharged Dagger is also available.



cylinders arranged in a similar fashion, but gives 80 h.p. at the maximum crankshaft speed of 2,400 r.p.m.

A new Cirrus feature is the type of cylinder used, this being of high-grade steel and located in the crank case by spigots and secured at its base by four short stout bolts.

High-grade hiduminium alloy castings are used for the detachable cylinder heads of the Minor. These are clamped by eight studs to a flange on the cylinder. The cylinder head actually forms one-half of the valve gear box and is fitted with an Elektron cover which acts as an oil bath for the mechanism. Two compression and one scraper ring are fitted to each of the pistons, which are of the slipper type. Hiduminium forgings are used for the connecting rods, and the crankshaft is a robust steel forging carried in five plain bearings with a ball thrust bearing at the front end. The rear end has a gear for operating the vertical driving shafts for the magnetos. A train of simple spur gears drives the camshaft from the front of the engine.

The crank case is an Elektron casting with all oilways carried internally. At its rear end and driven from the camshaft is an oil pump of the oscillating piston type. Resilient bearer feet are supplied.

DE HAVILLAND

AT the moment the De Havilland Aircraft Co., Ltd., of Hatfield Aerodrome, Herts, is producing the 130 h.p. Gipsy Major and the Gipsy Six of 200 h.p.

The Major is a four-cylinder in-line inverted air-cooled type with cylinders machined from forged carbon steel billets, the heads being of aluminium bronze with valve seats formed integrally. Pistons are of the slipper type, cast from aluminium alloy. The crankshaft, machined from a single forging is carried on five plain bearings in a crank case of aluminium alloy.

Top overhauls of the Gipsy Major are unnecessary, and 750 hours may be run between complete overhaul.

The Gipsy Six, as its name indicates, has six cylinders, these being air-cooled and similar to those of the Major. In spite of the greatly increased output over that of the Major, the

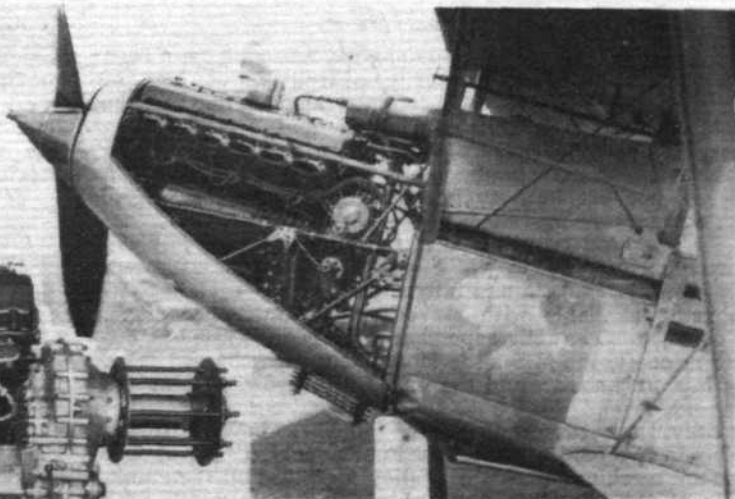
frontal area of the Six is no greater, and the overall length surprisingly little more. Included in the standard equipment of the Gipsy Six are an electric starter, duplex fuel pumps, twin carburettors, provision for an electric dynamo and alternative types of feet to suit the mounting on which the unit is to be installed.

Special high-compression versions of the standard Gipsy Six, giving 224 h.p., were installed in the D.H. Comet which won the speed prize in the MacRobertson race.

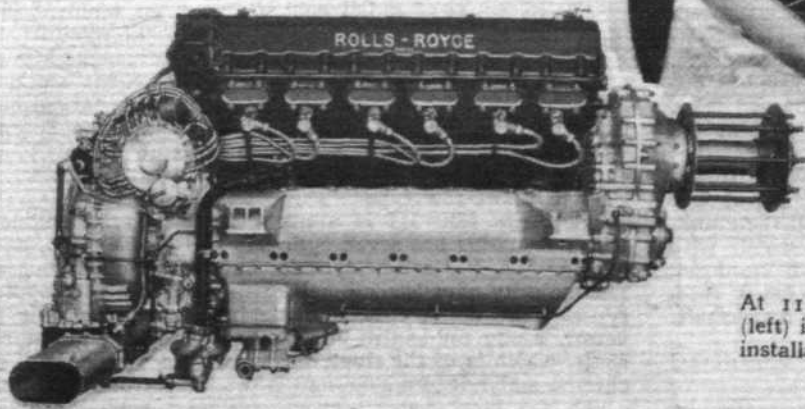
A new type of Gipsy Six is under development, this being the Series II, which is rated to give a higher continuous power output than the standard type, and is equipped for the operation of controllable pitch airscrews.

NAPIER

DURING the past few years D. Napier and Son, Ltd., of Acton, have been developing a series of air-cooled in-line type engines with cylinder banks arranged in the form of the letter "H." An inverted six-cylinder air-cooled unit, of 160 h.p., known as the Javelin, has also been produced. The name of Napier has for long been associated with the water-



At 11,000 ft. the fully supercharged Kestrel VI (left) is rated at 600 h.p. The top view shows the installation of a naturally aspirated Kestrel in a Hawker Hart.



cooled broad-arrow type engine, and the latest unit of this type to be produced is the Lion XV of 560 h.p. The smaller of the engines of "H" formation is the sixteen-cylinder Rapier, the latest version of which is the moderately supercharged Series VI, which has been designed to run on 87 octane fuel. At 4,000 ft. and 3,500 r.p.m. the power is 360 h.p.

Known as the Dagger, the larger "H" type, which has twenty-four cylinders, is produced in various forms. The latest in production are the Series II (695 h.p. at 10,000 ft.) and the Series III (725 h.p. at 3,500 ft.). The Series III engine is to equip an R.A.F. squadron.

Both the Dagger types are similar in construction, having a crank case of aluminium alloy, in two halves, with a detachable nose-piece forming a cover for the main reduction gears and housing the drives for the magnetos and distributors. The cylinders, which are in four banks of six, are steel forgings with heads of aluminium alloy. One inlet and one exhaust valve per cylinder are provided, being operated by hydraulic rockers.

The connecting rod assembly for each crank consists of a forked rod, in which the lead-bronze lined steel bearing shell is fixed, and a plain rod which oscillates on the outside of the bearing of the shell. The assemblies are arranged in groups of three, the front three starboard and the rear three port plain rods being attached to pistons in the top cylinders, the position of the forked and plain rods being reversed in the other cylinders.

The present Napier range also includes the Napier-Junkers Culverin compression-ignition engine, which gives 720 h.p. at sea level. This unit has six cylinders, with two pistons in each, and works on the two-stroke cycle.

POBJOY

A RECENT development by Pobjoy Airmotors and Aircraft, Ltd., of Rochester, is the Niagara II, an improvement upon the Niagara I, which, in 1934, was installed in the Monospar which won the King's Cup race.

The light alloy crank case of the Niagara II is in four parts, and carries a patented single-throw two-piece crankshaft on four bearings. The single crankpin is hardened, and on it runs a floating bronze bush running inside the hardened eye, integral with the nickel-chrome steel master rod, to which are linked the six articulated connecting rods. Of die cast aluminium, the cylinder heads are screwed to the steel barrels. The valve gear is completely enclosed in oil-tight aluminium castings. Each cylinder head carries one inlet and one exhaust valve, these being actuated by ball-bearing rockers. A reduction gear of the double helical type is fitted, and includes a shock absorber to eliminate chattering at low speeds.

The cowling is supplied as an integral part of the engine. All the air entering is forced to circulate over the cylinder heads or around the barrels by deflectors and helmets. Situated inside the outer bonnet are the exhaust collectors.

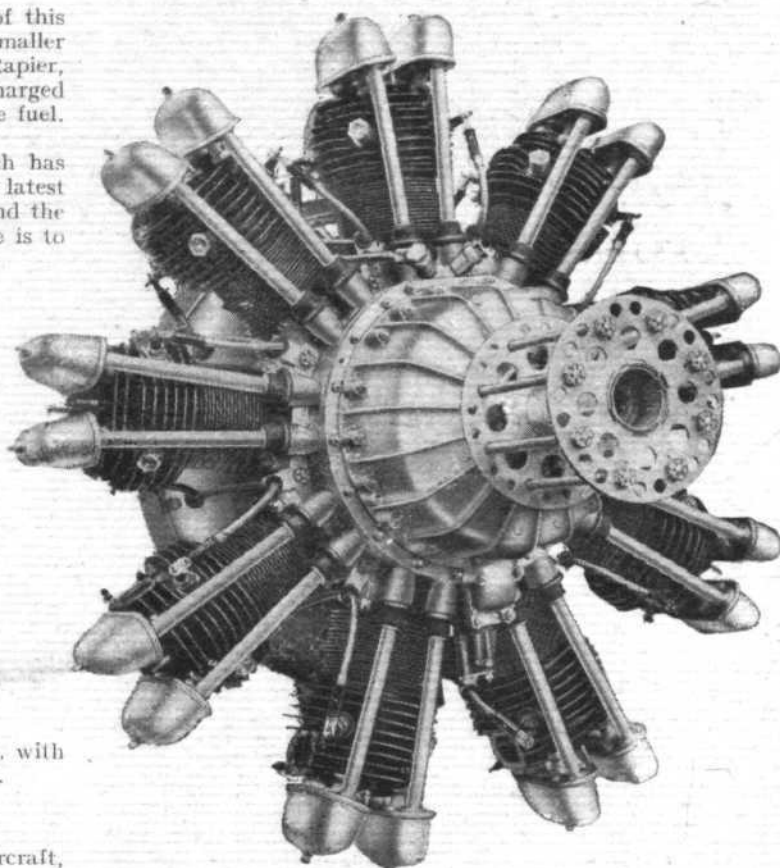
ROLLS-ROYCE

LIQUID-COOLED "Vee" type engines are, and have been for very many years, a speciality of Rolls-Royce, Ltd., of Derby. During the past ten years they have produced the Kestrel, Buzzard and Goshawk series, and special racing engines, one of which gave 2,300 h.p. for the last Schneider race. Their most recent production is the very powerful Merlin, which has not yet been type-tested, but which, in general outlay, follows previous Rolls-Royce practice.

By far the best known type is the Kestrel. This is being produced at present in three forms—normally aspirated, moderately supercharged and fully supercharged—each of these forms being available with reduction gear ratios of 0.632, 0.553 or 0.477. The fully supercharged version is rated at 600 h.p. at 11,000 ft., the M.S., the moderately supercharged type, at 675 h.p. at 3,000 ft., and the unsupercharged engine at 570 h.p. at sea level.

Basically, all the engines are similar, having twelve cylinders in two banks of six, cast in "monobloc" form. The pistons are machined from "Y" alloy forgings and the crankshaft is of the six-throw type of nickel-chrome steel, with one forked and one plain connecting rod on each crankpin. Two castings of aluminium alloy are used for the crank case, these being joined on a plane slightly below the crankshaft. Plain spur reduction gears are provided.

The supercharger, when fitted, is a high-speed centrifugal fan mounted co-axially with the crankshaft at the rear of the engine. Air is drawn through a twin-choke carburettor by



The 250 h.p. Scorpio is the most powerful engine of the Wolsley range at present in production.

an aluminium alloy impeller having radial blades and being driven by a speed-multiplying gear, with a special friction device to protect the gearing against shock and damage due to impeller inertia under sudden acceleration and deceleration of the crankshaft.

All engines in the present Kestrel series have been type-tested to run compositely cooled. This term is used to connote a system providing for partial water-cooling and partial steam cooling. It is possible to use a radiator which would normally be used for an engine of 25 per cent. less power. During a sustained climb this radiator is inadequate to dissipate all the heat generated, and steam is formed. This is led to a condenser, where the steam is condensed and taken back, as water, into the main cooling system.

SCOTT

A SMALL two-stroke aero engine designed specifically for use in very light aircraft such as the "Pou-du-Ciel" is being produced by the Scott Motor Cycle Co., of Shipley, Yorks. It is an inverted type with the air-cooled cylinders arranged in line. Straight spur reduction gearing having a ratio of two to one is provided. For a weight of 85 lb. the unit delivers a maximum of 34 h.p. at 5,200 r.p.m.

WOLSELEY

THREE types of radial engine are at the moment in production at the Birmingham works of Wolsley Aero Engines, Ltd. These are the 170 h.p. Aquarius, 225 h.p. Aries, and 250 h.p. Scorpio. Extensive development work is in hand, and a series of medium and fully supercharged engines is in the experimental stage. This includes the Scorpio II (250 h.p. at 5,000 ft.), Leo (280 h.p. at 6,000 ft.), Libra (390 h.p. at 6,000 ft.), and Gemini (565 h.p. at 6,000 ft.). The latter is a two-row type.

The Aries Mk. III is a nine-cylinder geared engine, the Mk. I Aquarius has seven cylinders and direct drive, and the Scorpio Mk. I is a nine-cylinder unit with reduction gearing. The majority of constructional features are common to all these types. The crank case is made in two halves, split transversely along the centre line of the cylinders, and the crankshaft, which is of the single-throw two-piece type, is of nickel chrome molybdenum steel and is produced from drop forgings which are machined all over. Cylinder barrels are carbon

British Aero Engines (Cont.)

steel forgings, and the heads, which have horizontal fins, are of aluminium alloy. The master rod, located in the top cylinder, is of nickel chrome molybdenum steel, and is of the solid big-end type. Similar material is used for the auxiliary connecting-rods, which are of H section.

Simplicity is the keynote of the design of the valve-actuating gear. A single cam is used, being driven in the same direction as the crankshaft. The drive for the cam is a double train of hardened steel spur gears, both the layshaft and the cam carrier running on ball bearings. As a single cam operates both the inlet and exhaust valves the valve period is the same for both.

BRITISH AERO ENGINES*Performance Data*

Maker and Type.	No. and Arrangement of Cyls.	Cooling.	Bore.	Stroke.	Compression Ratio.	Reduction Gear Ratio.	Normal Crankshaft R.P.M.	Rated Altitude.	Normal Output at Rated Altitude.	Max. Output at Full Throttle Height.	Take-off Power.	Dry Weight.	Remarks.
			m.m.	m.m.				ft.	B.H.P.	B.H.P.	B.H.P.	lb.	
A.B.C.: Scorpion Mk II ...	2 H.O.	A.	102	91.44	6	D.	2,300	S.L.	34	40	40	100	Ultra-light type.
AERO ENGINES: 750 c.c. Mk. I ...	2 H.O.	A.	76	82	—	D.	3,000	S.L.	21	26	26	80	Ultra-light type.
ARMSTRONG SIDDELEY: Genet Major Ia ...	7 R.	A.	108	114.4	5	D.	2,200	S.L.	150	165	165	327	—
Lynx IV C ...	7 R.	A.	127	139.9	5	D.	1,900	S.L.	215	240	240	515	—
Cheetah V ...	7 R.	A.	133.3	139.7	5.2	D.	2,100	S.L.	270	302	302	566	—
Cheetah VI ...	7 R.	A.	133.3	139.7	5.2	D.	2,100	6,000	290	322	307	631	Moderately supercharged.
Cheetah IX ...	7 R.	A.	133.3	139.7	6.35	D.	2,100	6,000	310	350	339	635	Moderately supercharged.
Serval I ...	10 R.	A.	127	139.7	5	0.657	2,000	S.L.	340	365	365	714	—
Serval III B ...	10 R.	A.	127	139.7	5.15	D.	2,000	6,500	340	381	368	732	Moderately supercharged.
Serval IV ...	10 R.	A.	127	139.7	5	D.	2,000	S.L.	350	380	380	—	—
Jaguar IV C ...	14 R.	A.	127	139.7	5	D.	1,700	S.L.	400	440	440	812	—
Jaguar VI C ...	14 R.	A.	127	139.7	5	0.657	2,000	S.L.	460	490	490	910	—
Panther VI ...	14 R.	A.	133.3	139.7	5.2	0.657	2,100	5,500	560	625	592	980	Moderately supercharged.
Panther VII ...	14 R.	A.	133.3	139.7	5.2	0.657	2,100	12,000	560	601	590	1,045	Supercharged.
Panther IX A ...	14 R.	A.	133.3	139.7	6.35	0.594	2,100	5,000	600	674	645	1,068	Moderately supercharged.
Tiger III A ...	14 R.	A.	139.7	152.4	5.35	0.637	2,050	12,000	610	656	625	1,159	Supercharged.
Tiger VI ...	14 R.	A.	139.7	152.4	6.2	0.594	2,150	5,000	760	810	840	1,180	Moderately supercharged.
BRITISH ANZANI: 1,100 c.c. Twin ...	2 I.V.	A.	83	101.5	—	D.	2,500	S.L.	26	34	34	99	Geared version also available.
BRITISH SALMON: A.D.9 ...	9 R.	A.	70	86	6	D.	2,100	S.L.	50	54	54	160	—
A.D.9.R Series II ...	9 R.	A.	70	86	6	0.5	3,000	S.L.	70	76	76	185	—
BRISTOL: Mercury VI S ...	9 R.	A.	146.9	166	—	See Note	2,400	12,500	605	645	620	975	Alternative gear ratios: 0.5, 0.666, or 0.572.
Pegasus III ...	9 R.	A.	146.9	191	—	See Note	2,200	3,500	690	750	775	1,010	Alternative gear ratios: 0.5, 0.572 or 0.444.
Pegasus IV ...	9 R.	A.	146.9	191	—	See Note	2,250	11,500	600	720	700	1,010	Alternative gear ratios: 0.5, 0.572 or 0.444.
Pegasus X ...	9 R.	A.	146.9	191	—	See Note	2,250	3,500	820	870	920	1,055	Alternative gear ratios: 0.5, 0.666, 0.572 or 0.444.
Civil-rated Aquila ...	9 R.	A.	—	—	—	—	See Note	S.L.	See Note	593	See Note	775	Engine rated at 500 h.p. at 2,600 r.p.m. (rated and maximum).
Civil-rated Perseus II ...	9 R.	A.	—	—	—	—	2,200	S.L.	665	770	770	1,026	—
Phoenix ...	9 R.	A.	146.9	191	—	0.655	—	—	415	430	470	1,090	Compression Ignition engine.
CARDEN: — ...	4 L.	W.	63.5	92.46	6.6	D.	3,000	S.L.	30	32	32	110	Ultra-light type.
CIRRUS-HERMES: Minor ...	4 I.L.	A.	95	127	5.4	D.	2,200	S.L.	70	80	80	210	—
Major ...	4 I.L.	A.	120	140	5.1	D.	2,100	S.L.	125	135	135	310	—
DE HAVILLAND: Gipsy Major ...	4 I.L.	A.	118	140	5.25	D.	2,100	S.L.	120	130	130	300	—
Gipsy Six ...	6 I.L.	A.	118	140	5.25	D.	2,100	S.L.	185	200	200	468	—
Gipsy Six R ...	6 I.L.	A.	118	140	6.5	D.	2,350	S.L.	—	224	224	542*	*With Ratier airscrew.
NAPIER: Lion XV ...	12*	W.	140	130	6	0.53	2,350	S.L.	560	605	605	1,000	*"Broad arrow" formation.
Javelin III ...	6 I.L.	A.	114	140	5.3	D.	2,100	S.L.	160	172	172	433	—
Rapier VI ...	16 H.	A.	80	89	—	—	3,500	4,000	360	395	365	707	Moderately supercharged.
Dagger II ...	24 H.	A.	97	95.25	7.75	0.372	3,500	10,000	695	760	640	1,362	Supercharged.
Dagger III ...	24 H.	A.	97	95.25	—	—	3,500	3,500	725	805	755	1,270	Moderately supercharged.
Culverin ...	6 L.	W.	122	210	—	0.693	1,700	S.L.	720	—	—	1,785	C.I. engine built under Junkers licence.
POBJOY: Cascade ...	7 R.	A.	77	87	—	D.	2,600	S.L.	65	70	70	126	—
Catacraft ...	7 R.	A.	77	87	—	0.47	2,900	S.L.	75	80	80	135	—
Niagara II ...	7 R.	A.	77	87	—	0.47	3,200	S.L.	84	90	90	150	—
ROLLS-ROYCE: Kestrel IV, V and VI ...	12 V.	W.	127	140	6	See Note	2,500	11,000	600	640	700	955	Supercharged. Gearing: Mk. IV, 0.632; Mk. V, 0.533; Mk. VI, 0.477.
Kestrel VII, VIII and IX ...	12 V.	W.	127	140	6	See Note	2,500	3,000	675	730	700	955	Mod. supercharged. Gearing: Mk. VII, 0.632; Mk. VIII, 0.553; Mk. IX, 0.477.
Kestrel X, XI and XII ...	12 V.	W.	127	140	7	See Note	2,500	S.L.	570	625	550	900	Naturally aspirated. Gearing: Mk. X, 0.632; Mk. XI, 0.553; Mk. XII, 0.477.
SCOTT: Flying Squirrel ...	2 I.L.	A.	73	78	6.8	0.5	2,800	S.L.	16	34	34	85	Ultra-light type.
WOLSELEY: Aries Mk. III ...	9 R.	A.	109	120	5.35	0.629	2,250	S.L.	205	225	225	510	—
Aquarius Mk. I ...	7 R.	A.	106	120	5.35	D.	2,250	S.L.	155	170	170	375	—
Scorpio Mk. I ...	9 R.	A.	111	120	5.25	0.629	2,250	S.L.	230	250	250	536	—

A. = Air. W. = Water. D. = Direct Drive. R. = Radial. I. = Inverted. H. = "H." Formation. V. = "V." Formation. L. = In Line. S.L. = Sea Level.

Private Flying



Topics of the Day

Dead Reckoning

THOSE owners or club pilots who habitually find their way from place to place by Bradshaw or by plain map-reading methods are missing a whole lot of fun. I know of few experiences more pleasant than that of sitting on a compass course and of coming out, at the end of so many minutes' flying, dead over one's objective.

In actual fact, of course, a navigated cross-country flight is usually an affair of continuous trial and error, and a nervous pilot can rarely resist the temptation to watch the landmarks as they appear—or fail to appear. Provided, however, that a really accurate wind estimate can be obtained, a vector diagram can be drawn or a C.D.C. wielded with sufficient accuracy to make map-reading virtually unnecessary after an initial check at the conclusion of, say, ten miles' or five minutes' flying.

Flying by Watch

ONLY twice have I actually had the moral courage to trust implicitly in my initial calculations, and on one of these occasions it was rather a case of necessity. I had to fly from Tollerton to Woodford and a heavy summer haze made landmarks absolutely indistinguishable at anything like a safe height over the distinctly wild terrain. After obtaining a preliminary check on a reservoir, the shape of which was obvious, I simply sat on the compass and came down when my watch told me that Woodford should be below. It was.

On the second occasion I went up above a lot of loose clouds and came through them again about a mile to the east of the aerodrome at which I had aimed. In this case there was a perfectly good sea coast to my left and if everything had gone wrong my position could always be discovered in a moment or two.

Commercial Accuracy

THOSE amateurs who think rather highly of their navigational capacities should endeavour to obtain the chance of flying with an experienced air-line pilot. Not so long ago I went over to Jersey in such circumstances and flew the machine more or less by myself from coast to coast in each direction.

This particular sea crossing is made in two sections, since one is not permitted to fly near the French coast and the turning point is, roughly speaking, the island of Alderney. Between Alderney and the Isle of Wight on the return journey I flew on the directional gyro and compass, keeping the height, as accurately as possible, at 3,500ft. with the help of a rate-of-climb indicator. At the English coast I was something like three miles off my course. The chief pilot was not too pleased with a performance which I considered to be extremely good.

Imagining that the initial calculations were perfectly correct, it simply meant that I had been flying, on an average, some two or three degrees off my course. Yet at one time I had imagined that to keep within a degree or two of an estimated course required the most phenomenally accurate flying.

After all, D/F or no D/F, it is a serious matter to be three miles off one's course at the end of eighty miles in really thick weather, and our kind of compass flying simply will not do for all-weather transport work.

Early Troubles

IN their early cross-country attempts most novices find it extremely difficult to discover quickly the direction in which the verge ring should be moved when a correction is necessary—and corrections are usually necessary as the first magnificent landmark is passed.

A tip which I found to be extremely useful was to remember that if the landmark (or track) is on one's left, an estimated number of degrees must be subtracted, while if it is on one's right these must be added. It is very helpful to draw "five degree lines" from each terminal on either side of the track line, so that, by noticing the position of the machine at a certain point, one has a fair idea of the amount of compass correction necessary. Lines at the destination will, in the same way, "lead one in."

Probably, the absolute novice will prefer to fly back to his track after making a straight correction rather than to carry on and to allow another degree or two. If the weather is thick he may otherwise miss all the carefully noted landmarks on the true track.

Ground Instruction

ALL of which suggests that quite a lot of time might be saved by instructors if each arranged for soloists and new licencees to gather together once a week, or once a fortnight, while he gave an impromptu lecture on the general problems of simple navigation.

He would be saved the somewhat tiring business of explaining the elementary points to each individual novice before they set off together for dual cross-country flight number one. A newcomer who is unable to correct an error in the air may appear very stupid to the experienced pilot, but, after all, we must all make a start and a little firm groundwork would help tremendously.

During the winter, instructional flying does not continue after four o'clock or so and there are many days on which pupils hopefully turn up and discover that flying has been washed out for the day. There are, in fact, plenty of chances for giving little lectures and these can be made quite interesting. The ability to land an aeroplane properly is important, but is hardly helpful when a novice wishes to go from here to there for the first time.

INDICATOR.

FROM the CLUBS

Events and Activity at the Clubs and Schools

LIVERPOOL

November's weather has been bad, particularly during week-ends, but 134 hr. 25 min. flying was recorded.

CARDIFF

Only one machine was in use last week at Splott, as another of the Cardiff Aeroplane Club's Moths was due for its C. of A., though G-ABOA is almost ready to fly again. Flying time, therefore, was severely restricted and totalled only 12 hr.

REDHILL

Mr. Bligh completed his night flying tests, Mr. E. Stone and Mr. Maxell have passed the tests for their "A" licences and three members are taking instructor's courses. There are four new members.

Last week's flying time totalled 82 hr. 10 min.

LONDON

Sixty-six hours' forty-five minutes' flying was done by the London Aeroplane Club last week, and of this 40 hr. 15 min. was put in during the fine week-end.

The Club held its annual general meeting at the aerodrome on Sunday, November 25.

TOLLERTON

Last week-end members had the agreeable opportunity of flying a B.A. Swallow brought over by Mr. Rogers. The chief event of last week was a dance given at the Clubhouse by Mr. D. E. Hutchinson.

The weather prevented a higher total than 12 hours' flying being reached last week. Mr. L. A. Chambers has joined as an associate member.

CAMBRIDGE

Flying time recorded by Marshall's Flying School, Ltd., and the Cambridge Aero Club, Ltd., totalled 46 hr. 50 min. during the week ending November 30. Last Sunday ten members of the C.A.S.C. attended and put in 5 hours' flying. A severe snowstorm completely stopped flying for a short time. Five members of the new Cambridge squadron flew.

WITNEY AND OXFORD

Wireless and a practice parachute and table are being provided at the aerodrome, and pupils and members will be able to take instructional courses in the near future at very reasonable rates. It is proposed to start a sports section at once.

New members are Mr. Jack Brain, who will train for his "B" licence, and Mr. G. R. Secretan, who intends to take his "A." Of last week's flying total of 15 hours, 10 represented solo flying.

YORKSHIRE

A Scott-powered "Pou" has been making test flights at Yeadon and recently flew to the neighbouring aerodrome of Sherburn.

Mr. Hilton has passed his "A" licence tests, and Mr. W. Cull has become a flying member. Mr. Macalpine expects to take delivery of his new Hornet shortly.

Club machines flew about 18 hr. last week, and the total flying time for November was 76 hr. 20 min.

No less than 234 members and friends were present at the Club's Annual Ball on November 29. This is the highest attendance so far recorded for this function.

HANWORTH

Tests for the "A" licence have been passed by Messrs. Hoppe and Hood, and Miss B. Russell, Messrs. Castlemain and Bowles have become members.

Last week's flying time totalled 29 hr. 20 min.

WILTSHIRE

During the fortnight ended November 27, Mr. E. Larmour, R.A., obtained his "A" licence at the Wiltshire School of Flying and two new pupils, Mr. R. Musprat-Williams and Miss Lodge, joined the school. Miss Lodge, incidentally, is a daughter of Sir Oliver Lodge, the famous scientist.

CASTLE BROMWICH

Mr. R. Beard has gone solo, and Mr. E. Baker now possesses his "A" licence.

Last week's flying times were 14 hr. dual and 5 hr. 50 min. solo. Visitors included Mr. W. Gairdner in a United Airways Dragon, and Mr. Guy Robson in his Leopard.

SOUTH COAST

Bad weather again held up instructional flying at the beginning of last week at Shoreham, but an improvement later on enabled the Club to do nearly 20 hours of flying. Mr. Pashley, the chief instructor, is giving a series of lectures on navigation, aerodynamics and airmanship. The first lecture was held on Friday, November 29. Messrs. Abell, Hervey and Porter have joined the South Coast Flying Club.

PORTSMOUTH

The quarterly landing competition for the Berney Cup was held on Sunday, November 24, and both the number of entries and the standard of flying were higher. The winning four members were Lt. Paul, R.N., Flt. Lt. Luxmoore, Mr. Courteney Coles and Capt. Coath.

Lt. Adams, R.A., qualified for his "A" licence at Portsmouth during the week, in which 43 hr. 40 min. flying was done. Mr. Randall visited Heston on Tuesday, Mr. Frost visited Haldane and Bristol on Thursday, and two aeroplanes were taken to High Post on Sunday of last week by Messrs. Paul, Frost, McKee and Sadler.

CINQUE PORTS

Miss Jeanne de Casalis, the actress, has completed her first solo and will shortly be taking the tests for her "A" licence.

There was considerable night flying activity last week. Mr. A. J. S. Morris, who was at Hamble on Tuesday, is now in possession of a G.A.P.A.N. certificate entitling him to instruct in blind flying up to the highest category, excluding radio. The blind flying course is proving popular, and the weather certainly seems suitable. Mr. W. E. Davis, the managing director, accepted the Folkestone Chamber of Commerce's invitation to address it on the subject of "Does Folkestone Need an Airport." As a result of this plans are in hand for the development of a scheme.

On Saturday an Imperial Airways machine called in while on a charter trip to Paris.

Flying time for the week ending last Thursday was 38 hr. Mr. Cecil Brooke has become a member.

On December 20 the Christmas dance will be held at the Leas Cliff Hall, Folkestone.



APPROVED : Three Miles Hawk Trainers, a type which has now been approved for Air Ministry training, standing in front of the new Phillips and Powis Reserve School buildings at Reading. With the modern tendency towards monoplanes for Service use, the approval was only logical. (Flight photograph.)

Private Flying

LEICESTERSHIRE

The Christmas fancy dress party and dance will be held on Friday, December 13, in the Clubhouse at 8.30 p.m.

BROOKLANDS

Another well-attended tea dance was held last Sunday. Flying time for the week came to 80 hours and Miss Lea Wardell took her "A" licence. Messrs. Glossop and Grenside have gone solo and Mr. Buchan is taking a course of instrument flying.

On Thursday of last week, despite bumps, Miss Joan Meakin took-off in the glider built by the College of Aeronautical Engineering for the London Gliding Club, and was towed to Heston by an Avro belonging to the Air Publicity Co., Ltd., piloted by Mr. M. E. Hearn. A new Hornet Moth has been delivered from Hatfield.

HULL

Messrs. Santangelo, Ford, Norfolk and Dutton have taken their "A" licences during the past few months, and first solos have been made by Messrs. A. and O. Hellyer, Nutt, Scarborough and Foster.

There will be a hot-pot supper on December 12, the object of which is to introduce scholarship pupils to the members—and to each other. On Boxing Day the competition for the Blackburn Cup will take place, and on the same day a programme of films will be shown.

The Club's Annual Dance will this year take the form of a New Year's eve celebration.

RANGOON

During October, 57 hr. 15 min. flying time was logged by the Rangoon Flying School. Mr. D. B. Petch has become a pupil, and a Fox Moth is a welcome addition to the establishment of the school.

Maung Ohn Pe, Mr. M. Y. Khan and Mrs. V. Isaacs have completed their tests for the Indian "A" licence.

Mr. R. H. Rose took charge of the flying school from October 26 to the end of the month in the absence of Flt. Lt. Arthur, who was away in Singapore for a navigator's examination.

Keep Clear

A RECENT *Notice to Airmen* warns pilots to avoid flying in the vicinity of Queen Bee radio-controlled Tiger Moths. Their marking scheme, as in the case of training types, involves the extensive use of the colour yellow, but these machines have only the upper side of the main planes, the under side of the wing tips and both surfaces of the tailplanes so coloured. Queen Bees are normally flown within five or ten miles of an aerodrome, aircraft practice camp or a fleet at sea.

These machines must not be confused with the Tiger Moths of the London Aeroplane Club, which have bright yellow fuselages! Incidentally, there is a temporary crane at the south-west corner of the D.H. factory at Hatfield, and this is fifty to eighty feet in height.

The Yorkshire Association

AT a meeting held on November 27 the recent proposal to form an association of flying clubs was placed before representatives of seven clubs and schools, including one, the Harrogate Aeroplane Club, now in process of formation. A letter supporting the proposal was also received from another club.

Another meeting, at which officials will be elected and a plan of action drawn up, will be held in the course of the next fortnight.

Southend's Party

THE fourth annual supper ball of the Southend Flying Club will be remembered by the guests for at least two good reasons.

Number one concerned the unexpected arrival of a pilot who, on his "B" licence cross-country and after being given a very wrong wind speed, put down in the dark in the town. Apparently he had already landed and taken off from a field near Dagenham, and, after his second lucky forced landing, had heard that there was a party in progress, and had availed himself of the excellent opportunity. His nervous tension while approaching a patch of blackness surrounded by lights was probably only equalled by his terror at being called upon to reply for the visitors after no previous notification that such an effort would be expected of him. Apparently he was lucky enough to get down in a road without damage of any kind, though the machine had to be dismantled.

Reason number two was the telegram from Mr. Brian Allen, who is in Addis Ababa, which was read during the evening by Mr. Weber.

There were actually four toasts—three official and one unofficial, but none the less important. The Mayor of Southend, Councillor Alec White, proposed that of the club, and said that in three years the number of members had increased from 170 to 370, with more than 100 flying members. The president, Mr. G. E. Weber, replied, and explained that the club was losing the services of Capt. Glover, the chief instructor; Mr. Lawson was to carry on.

Actually, and in due course, Capt. Glover is to join the Airwork School of Flying. It will be remembered that Capt. Baker is leaving, and that Mr. Brian Davy is taking over his work; Capt. Glover will be second in command.

The vice-chairman, Mr. H. Clarke, proposed the toast of the ladies and visitors, replied to by the itinerant pilot and by Miss Ford, while Mr. A. Seton Bowers toasted the president, and Mr. Smith toasted the pupils. No one had the courage to reply to the last.



REVIEW: There were twenty-eight competitors in the Polish National Soaring Competition held in September and October at Ustianowa in the Carpathians. The various machines are shown here lined up before the start of the contests during which the greatest duration recorded was 20 hrs. 15 mins. and the greatest distance 87 miles.



BRITISH MILITARY AIRCRAFT

EXTREME caution is necessary in assessing the qualities of military aeroplanes. One nation may possess a fighter for which it will claim a speed superior to that of any foreign machine in its class. Another, perhaps, will produce a bomber to fly for a greater distance than its opposite numbers abroad. Possibly a third may build a flying boat to weather seas on which others would not venture.

These isolated qualities, however, do not confer on a manufacturer the right to claim for his particular aeroplane that it is the finest of its type in the world.

The fastest fighter might conceivably be a poor climber or sluggish on the controls. A small bomb load could condemn the bomber, and the flying boat might be so heavy that its small disposable load would render it useless for war service.

It has always been the pride of British manufacturers that their machines are good "all round," and therein, no doubt, lies one explanation of foreign interest and custom.

The following material should suffice to reveal the diversity of the military types available in this country, and when it is remembered that versatility is an exceptionally strong feature of British military aircraft, it is apparent that there is much to attract foreign trade.

ARMSTRONG WHITWORTH

SHORTLY after the war, in which "A.W." machines saw considerable service, Sir W. G. Armstrong Whitworth Aircraft, Ltd., of Coventry, planned a programme of intensive development work in the field of metal construction. Its Siskin and Atlas were for long standard fighter and army co-operation equipment in the Royal Air Force.

The Scimitar the latest A.W. fighter, is a high-performance single-seater biplane of unequal span, with the pilot seated just aft. of the top plane. He is armed with two Vickers

Fighters Five: Reading from the top—Gloster Gladiator (715 h.p. Mercury IX), Gloster Gauntlet (605 h.p. Mercury VI S), Bristol Bulldog IV (605 h.p. Mercury VI S), Armstrong Whitworth Scimitar (600 h.p. Panther), Hawker Fury (600 h.p. Kestrel VI).



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FLIGHT.

DECEMBER 5, 1935.

The Hawker Osprey (top left) is a two-seater fleet fighter with 600 h.p. Kestrel V engine. A number of specially equipped Demons (Kestrel V) of the type shown below have been supplied to Australia.

machine guns and a rack for four 20lb. bombs can be fitted to the lower starboard main plane.

The new A.W.XXIII bomber-transport monoplane built for the R.A.F. is at present undergoing official tests, and detailed information is not available for publication. It is, however, a twin-engined machine with a cantilever wing, an unusually roomy cabin for the transport of troops, supplies, spare engines, etc., and machine guns in the extreme nose and tail, transparent turrets of Armstrong Whitworth design being provided. Power is furnished by a pair of Siddeley Tiger VI 760/840 h.p. radials and the undercarriage is retractable into the engine nacelles.

BLACKBURN

FOR very many years the Blackburn Aeroplane and Motor Company, Ltd., of Brough, East Yorkshire, has been engaged in the production of machines for the Fleet Air Arm and of large flying boats. A large number of Baffin torpedo-bomber biplanes is now operating from aircraft carriers, but the latest Blackburn product for Fleet work and for coastal defence is the Shark, classed by the Service as a torpedo spotter reconnaissance type.

The Shark is an all-metal sesquiplane, the two-bay wings, which are braced by an "N"-strut system, being designed to fold without the use of jury struts. Monocoque construction is used for the fuselage, which is completely buoyant, thus obviating the fitting of flotation gear. A dinghy is provided for the crew, which consists of two or three men, according to the duties to be undertaken.

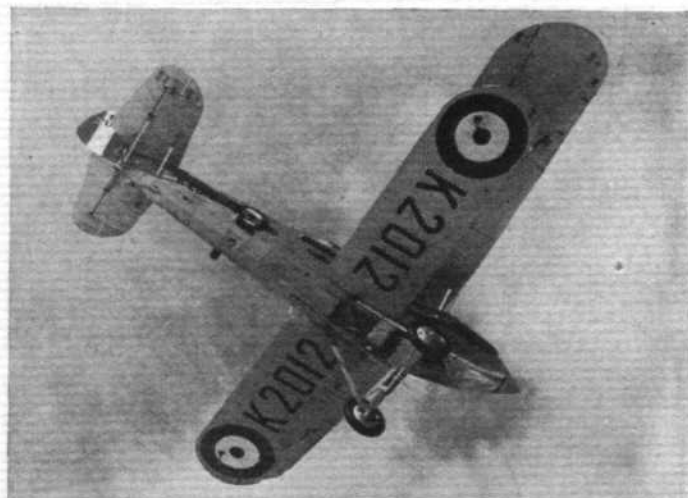
A synchronised gun is fitted beneath the forward cowling and a "high speed" mounting is included in the rear cockpit for a second weapon. Provision is made for carrying a torpedo weighing up to 1,500lb. on a Blackburn carrier beneath the fuselage, or a bomb load of equal weight can be slung beneath the wings.

A float undercarriage may be fitted, this being a steel tubular structure with Alclad floats of Blackburn design. An important feature is the interchangeability of one float with the other.

BOULTON PAUL

PERHAPS the most successful aeroplanes which have emanated from the Norwich works of Boulton Paul Aircraft, Ltd., are the medium bombers which the company has supplied to the Royal Air Force. The Sidestrand (originally classed as a day bomber) was the first of this type to go into service. Eventually the machine was developed into the Overstrand, and this is the latest type in use.

The Overstrand is a twin-engined biplane with wings of high aspect ratio and equal span. A

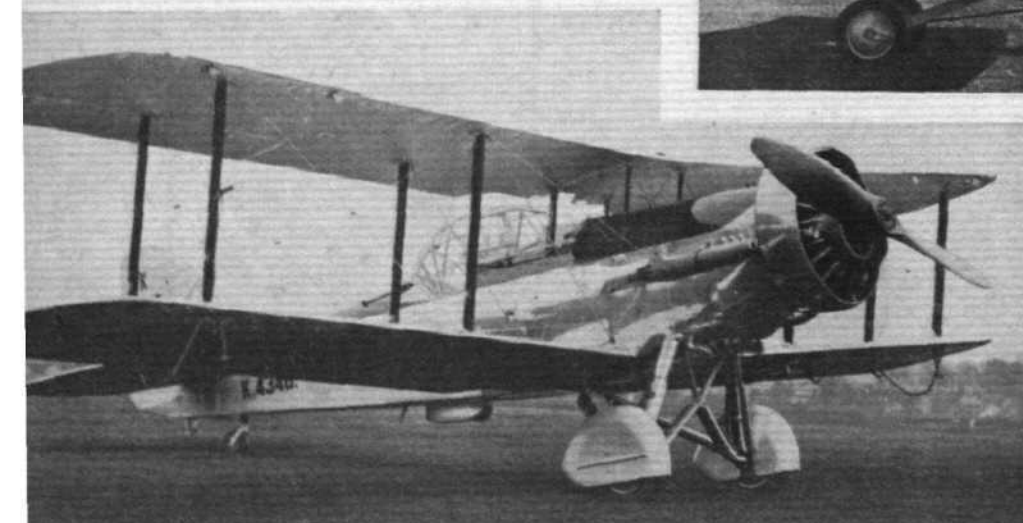


The Hawker Audax (Kestrel 1B or X) is intended for army co-operation.

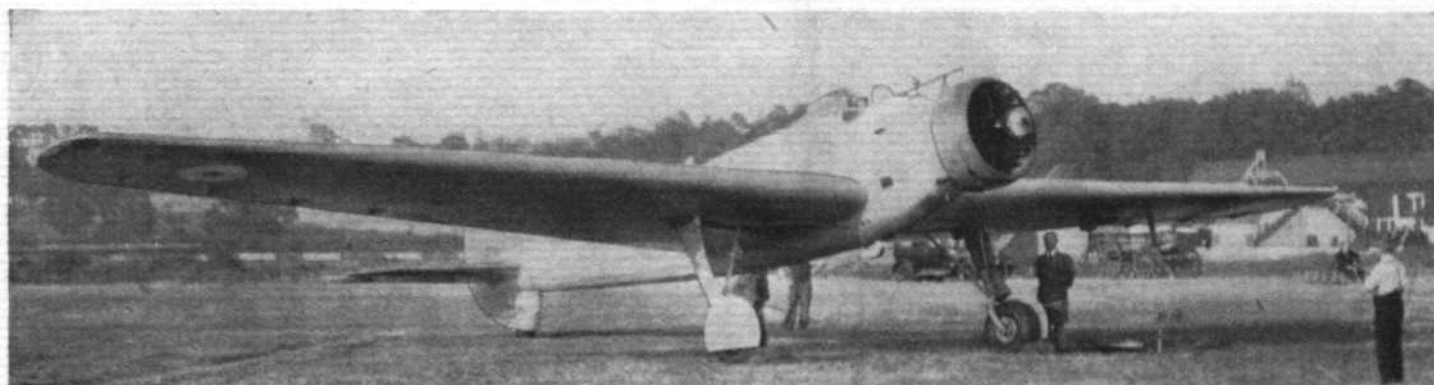


A general-purpose type, the Hawker Hardy is fitted with the 575 h.p. Kestrel X.

Enclosed cockpits are a feature of the 580 h.p. Pegasus-powered Wallace general-purpose biplane.



A standard medium bomber in the R.A.F., the Boulton Paul Overstrand (two Pegasus II M.) is fitted with the recently developed Boulton Paul gun turret. The Vickers Wellesley (below) is a new medium bomber with Pegasus XVIII engine.



With the 600 h.p. Kestrel V the Hawker Hind does about 200 m.p.h.

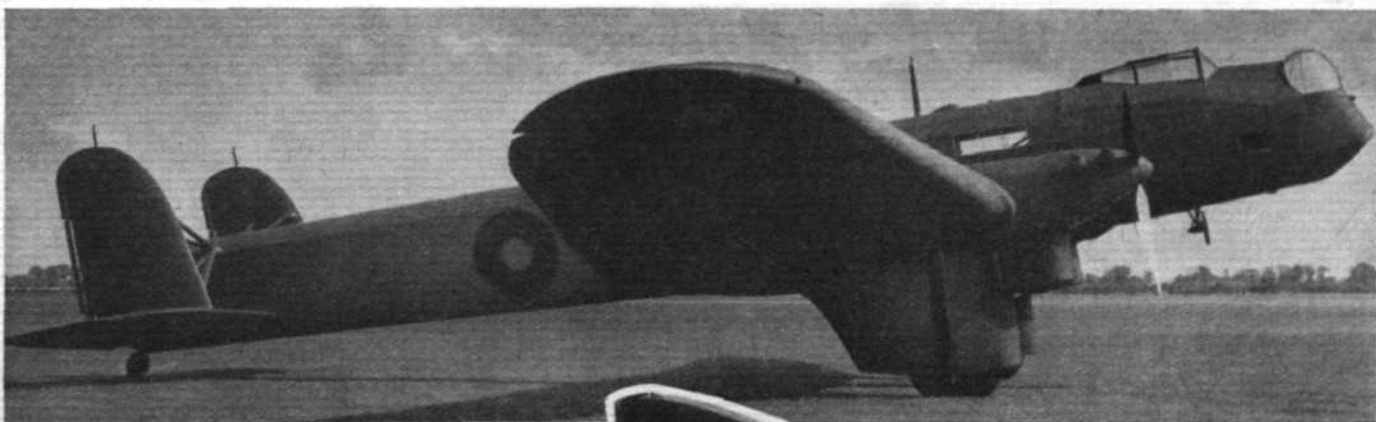
crew of three is normally carried and three gun positions are provided for defensive purposes. In the nose there is an ingenious revolving turret of Boulton Paul design. This is arranged to be rapidly rotated round its vertical axis by the gunner, the gun itself being elevated or depressed in a slot. There is a screened gun ring on top of the fuselage behind the wings and below, and slightly to the rear of this, is a third gun mounted at the mouth of a tunnel in which the gunner lies prone.

Two Bristol Pegasus II M.3 radials rated at 580 h.p. are fitted, being provided with Boulton Paul ring cowlings.

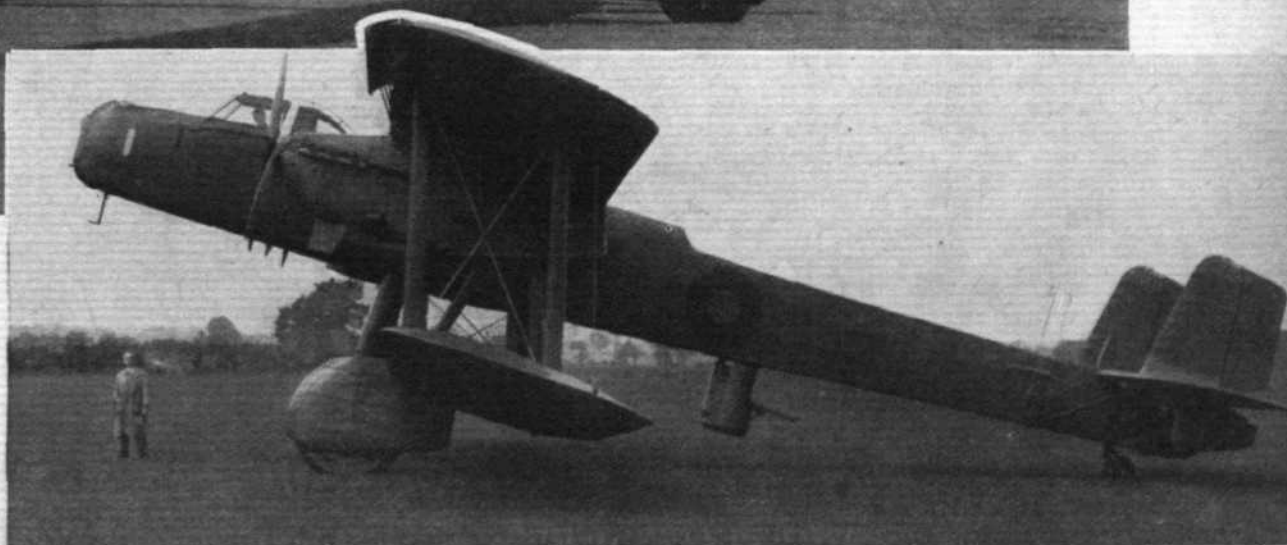
Designs have been prepared for a very much improved version of the Overstrand, and the name Superstrand has been given to this type, which will be built only to order. With two Pegasus IV engines rated at 660 h.p. at 11,500 ft., this machine is estimated to do 191 m.p.h. A retractable undercarriage and improved accommodation for the crew are specified.

BRISTOL

IT was in 1910 that the British and Colonial Aeroplane Company, from which has grown the Bristol Aeroplane Company, Ltd., of to-day, produced its first aeroplane. The Bristol Fighter designed during the war and in service until



Two heavy bombers : The Fairey Hendon (top) and the Handley Page Heyford (right) are both fitted with 600 h.p. Kestrel VI's.





The first torpedo spotter reconnaissance machine to go into service with the R.A.F. is the Blackburn Shark (760 h.p. Tiger). The Fairey Swordfish (below) is also a T.S.R. and has been adopted for service. The engine is a 690 h.p. Pegasus III M.3.

a few years back, is one of the world's best known aeroplanes, and subsequent types from Bristol, notably the Bulldog, have achieved great popularity.

The original Bulldog biplane, built some eight or nine years ago, was developed into the Bulldog IIa, and as such was adopted by the Royal Air Force and issued to several fighter squadrons. More recently the type has been further improved, and the latest version, the Bulldog IV, is the subject of the following notes.

Provision is made for two Vickers guns, which fire through troughs in the cowlings, for wireless, night flying gear, four 20lb. bombs and, naturally, oxygen equipment.

The engine fitted is the Bristol Mercury VI S.2, a nine-cylinder geared and supercharged radial of 603 h.p. specially developed for use in fighting aeroplanes.

Another recent Bristol product is the "130" bomber-transport. This is a high-wing, twin-engined monoplane with a machine gun in the nose and tail and a spacious cabin. The engines, which are mounted in nacelles forward of the leading edge of the wing, are of the Pegasus type, those in the prototype being Pegasus III's of 690 h.p. each.

A military development of the low-wing twin-engined monoplane referred to in the Civil Aircraft section of this issue has been planned as a medium bomber.

DE HAVILLAND

THE military aircraft being built at the present time by the De Havilland Aircraft Co., Ltd., of Hatfield, Herts, are developments of some of the company's highly successful commercial types. During the war, and, for that matter, for many years after it, the name of De Havilland was very closely linked with military aeronautics, but in recent years the company has concentrated on the development of civil aeroplanes. Lately the D.H.89, or Rapide, twin-engined cabin biplane was converted into a general reconnaissance machine for the Air Ministry.

As supplied to the R.A.F. the prototype D.H. 89 (Conversion) carries a crew of three, consisting of a pilot, observer-bomber and wireless operator-gunner. The pilot has a fixed Vickers gun and there is a Lewis gun on a disappearing mounting on top of the fuselage behind the wings. Provision is made for the internal stowage of two 100lb. bombs and four 20lb. bombs.

FAIREY

BOMBERS, fighters, general purpose and reconnaissance machines built by the Fairey Aviation Co., Ltd., Hayes, Middlesex, are in everyday use in the service of a number of nations. Since its foundation in 1916 the Company has received a number of large contracts from the British Air Ministry. At the present time it is working on two types for the Royal Air Force, these being the Hendon long-range heavy bomber, and the Swordfish T.S.R.

The Hendon is a low-wing cantilever monoplane with provision for internally stowed bombs, or, alternatively, for the carriage of a number of troops. A revolving turret in the extreme nose houses a free machine gun, and there are two more gun positions behind the wing, one on top of the fuselage and the third in the extreme tail. As supplied to the Royal



Air Force the Hendon will be fitted with two fully supercharged Rolls-Royce Kestrel VI engines of 600 h.p.

A biplane of unequal span, the Swordfish T.S.R. type is a two-bay machine with a single Bristol Pegasus III M.3 radial of 690 h.p. The pilot and observer are armed with the usual machine gun each, and the projectile load takes the form of either a single torpedo carried beneath the fuselage or a heavy bomb load.

GLOSTER

FOR a number of post-war years the Gloster Grebe and Gamecock single-seater fighter biplanes were standard equipment in the Royal Air Force. Since these machines disappeared from the Service the Hucclecote (Gloucester) works of the Gloster Aircraft Co., Ltd., have turned out two more single-seaters, both of which have been adopted.

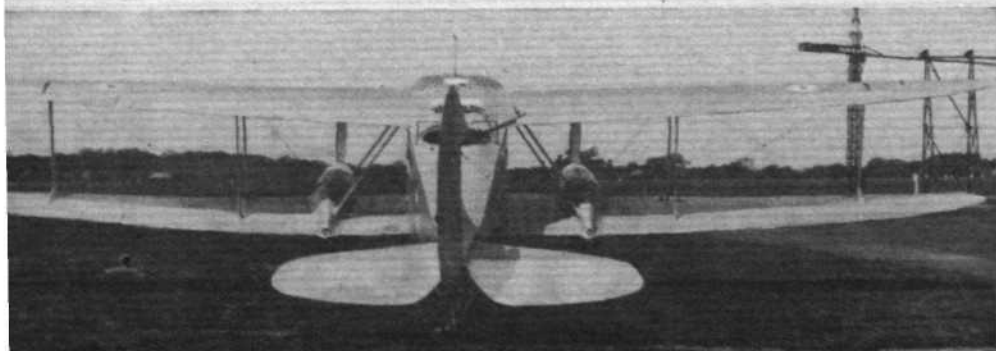
The first of these, known as the Gauntlet, is already being issued to squadrons. It is a biplane with two-bay wings of equal span. Included in the normal equipment are two Vickers machine guns with 1,200 rounds of ammunition, full night flying gear, wireless receiving and transmitting equipment and oxygen apparatus. Four 20lb. bombs may be carried beneath the lower port plane.

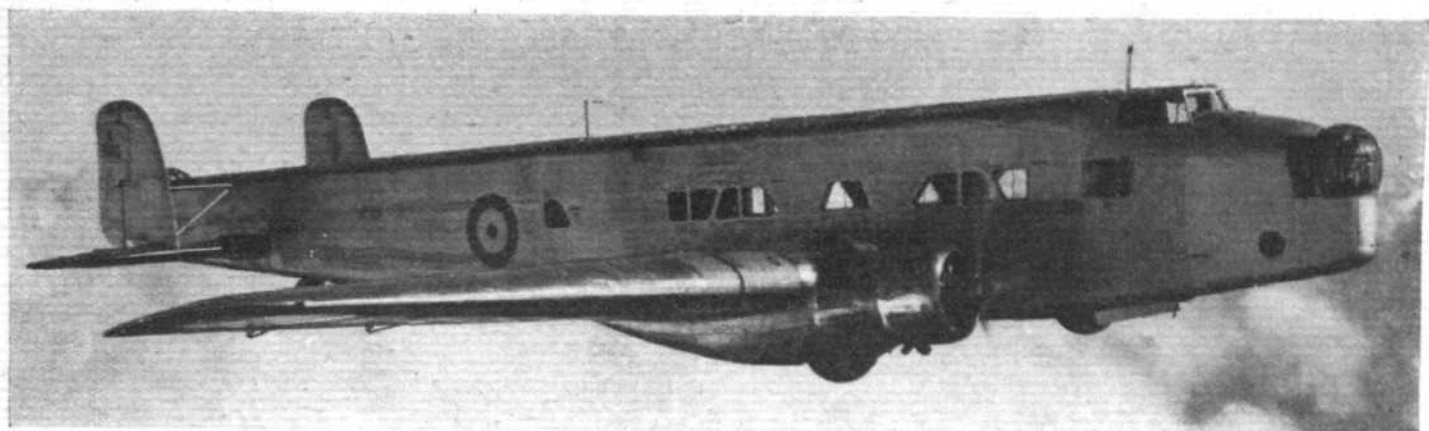
Square tubing is utilised for the front portion of the fuselage, the joints being of the flat-plate type, secured by hollow rivets. The rear part is built up of round tubes and the joints are of the wrapper plate type, the whole structure being braced with tie rods. Spars of high-tensile steel strip are used in the wings, the ribs being of duralumin. As supplied to the Royal Air Force the Gauntlet is powered with a Bristol Mercury VI S engine of 605 h.p.

Four machine guns are carried on the Gladiator, the second type to be adopted, two being mounted in the fuselage and



Both the Avro Anson (above) and the D.H. 89 coastal reconnaissance machines have been developed from civil types. The engines respectively are Cheetah IXs and Gipsy Sixes.





With two 760 h.p. Siddeley Tiger VI engines the A.W.XXIII bomber transport has a high performance.

the remaining pair being fixed to the lower planes. Essentially the machine is a development of the Gauntlet but differs from it mainly in that it has single-bay wings arranged to give rigidity equal to that of the Gauntlet's, and a single-strut cantilever undercarriage fitted with Dowty internally sprung wheels.

HANDLEY PAGE

NOTED in the military field for its large bombing aeroplanes Handley Page, Ltd., of Cricklewood, London, has been producing such machines for the Royal Air Force ever since the war. The latest "H.P." heavy bomber to be accepted for service use is the Heyford III, a direct development of the earlier Heyfords, which already form the equipment of certain squadrons.

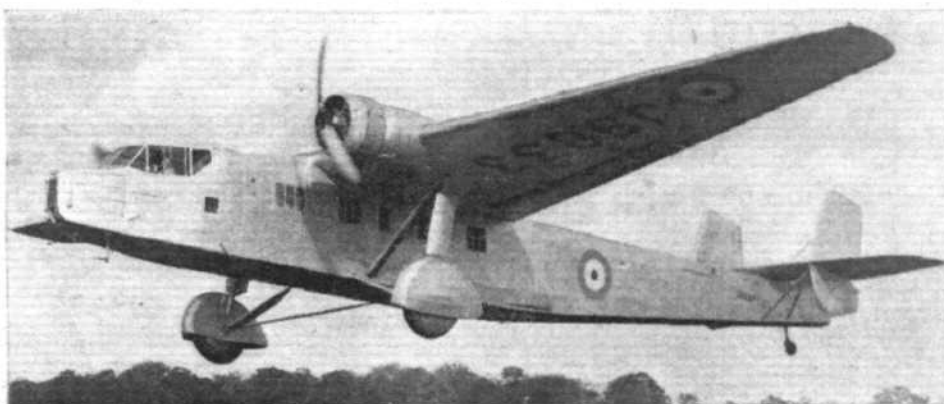
Basically, the Mk. III Heyford is similar to its predecessor. The centre section of the lower planes is thickened to accommodate the bomb load. Perhaps the most striking feature of the design, however, is the "hanging" of the fuselage below the top plane. Three gun positions are provided, these being in the nose, on top of the fuselage behind the wings, and one in a retractable and revolving turret below this second. Kestrel VI engines are specified for the Mk. III version, giving a maximum speed of about 150 m.p.h. at high altitudes. A large amount of experimental work has been done with a cockpit enclosure for the pilots.

Some months ago the Company completed an interesting general-purpose monoplane to an Air Ministry specification. The application of slots and flaps gives this machine a wide speed range.

The latest Handley Page product is a very large bomber transport, a high-wing monoplane with two medium supercharged Siddeley Tiger engines.

HAWKER

AN amazingly large percentage of the aeroplanes in Service with the Royal Air Force are of Hawker design, although not all of them have been built in the factory of Hawker Air-



Slotted flaps help to give the H.P.51 bomber transport (two Tiger VI) a wide speed range.

craft, Ltd., at Kingston, Surrey. Equally amazing is the fact that all these machines have been developed from two original designs—the Fury single-seater and the Hart two-seater.

The Fury is a single-seater fighter with heavily staggered single-bay wings and a Rolls-Royce Kestrel VI supercharged engine of 600 h.p. Two machine guns are mounted, and if necessary wireless may be carried. A development of the Fury, the Nimrod (Kestrel V) is a single-seater fleet fighter which is a rather heavier machine with increased wing area.

In the two-seater series the following types are in use by the R.A.F.: Hart, Hart Trainer, Hart (Communications), Hind, Audax, Osprey, Demon and Hardy.

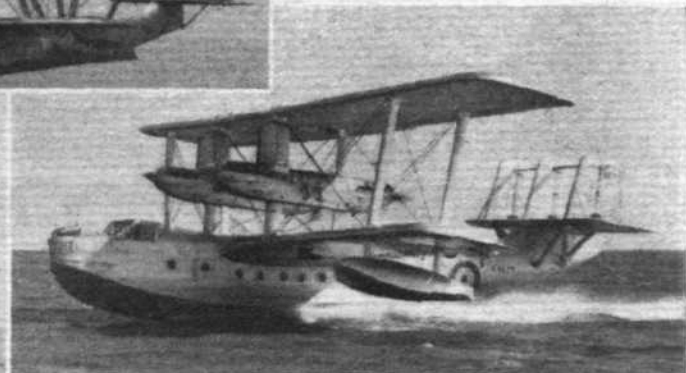
The Hart II is a light bomber with the 525 h.p. Kestrel IB high-compression engine. Both the Hart Trainer and Hart (Communications) are similar, but carry no military equipment, being fitted up for their respective duties. The Hind may be regarded as a replacement for the Hart. Its all-up weight is considerably greater and it is fitted with the fully supercharged Kestrel V engine of 600 h.p. Like the Hart it carries about 500lb. of bombs. In the army co-operation class the Audax is standard equipment. Machines of this type at present in service have the Kestrel IB, but subsequent models are receiving the 575 h.p. Kestrel X. A second



The graceful Bristol 130 is another bomber transport and employs two moderately supercharged Pegasus radials.

A general-purpose flying boat, the Saro London (top) has two Pegasus III engines. The Supermarine Seagull V (bottom

left) uses a Pegasus as a pusher installation. The Short Singapore III has four Kestrels.



Hawker army co-operation type has actually been adopted, this being the Hector, with the Napier Dagger III air-cooled engine of 725 h.p. As a two-seater fleet fighter reconnaissance machine Hawker Aircraft are supplying the Osprey with Kestrel V engine. Incidentally, a large number of parts for the Hawker fleet machines are being manufactured from stainless steel. The Demon (Kestrel V) is the two-seater fighter of the series. A general-purpose development of the basic Hart design is the Hardy (Kestrel X), which is intended for operation abroad and has provision for desert equipment.

Although the Service Hawker types use the Rolls-Royce engine, they are actually designed to take almost any power unit between 500 and 900 h.p.

AVRO

THE manufacture of military training aircraft is, perhaps, the forte of this Manchester firm which has been producing them in large quantities since 1917 when the historic 504.K biplane was adopted by the Royal Flying Corps. In 1924 that type was replaced by the 504.N, which in its turn was superseded in 1932 by the Tutor.

The Tutor is now the standard trainer of the R.A.F. It is an equal-span biplane, having a heavy stagger in order to provide good overhead view and to facilitate egress from the front seat. For seaplane training the structure is specially treated to withstand the corrosive action of sea water, and twin metal floats are substituted for the normal split axle under-carriage. The engine normally fitted is the Siddeley Lynx of 215 h.p.

From the Tutor has been developed the Avro 626 (Cheetah), which is intended for the instruction of military flying personnel in all branches of flying from elementary training to advanced aerobatics, including also night and blind flying and seaplane training as well as instruction in gunnery, bombing, photography and wireless operation.

At the moment the company is building a large number of coastal reconnaissance machines for the equipment of several general reconnaissance squadrons of the R.A.F. They are of the Anson type, which is a development of the 652 commercial monoplane described in the civil aircraft section of this issue. Cheetah IX engines of 310 h.p. at 6,000 ft. are being specified for the production Ansons. A crew of three is carried, and stowage for 360 lb. of bombs is provided inside the wings. The pilot has a fixed gun, and a second gun is mounted in an Armstrong Whitworth turret behind the wings.

SARO

TWO types of machines built at the Cowes (I.O.W.) works of Saunders-Roe, Ltd., have been adopted by the Royal Air Force. These are the Cloud

navigational training amphibian, with two Siddeley Serval engines and the London general-purpose flying boat. The Cloud, in its civil form, is dealt with in the appropriate section of this issue.

Good seaworthiness and the comfort of the crew have received first consideration in the design of the London, a small sacrifice in performance being entailed. The hull is quite exceptionally roomy, enabling the crew to work and sleep in comfort, and is designed for operation from the open sea, even in an overloaded condition, for which, incidentally, it can be fitted with tanks allowing a 1,400-mile range.

The wing structure is of unusual interest in that it is entirely of stainless steel.

Two 690 h.p. Bristol Pegasus III medium supercharged radials are mounted in nacelles under the centre section, and are fitted with combined exhaust collectors and Townsend rings of polygonal form. Gun rings are provided in the bows, on the deck of the hull behind the wings and in the extreme tail.

SHORT

A PIONEER company in the development of metal construction for marine aircraft, Short Bros. (Rochester and Bedford), Ltd., are, at the moment, working on a series of Singapore III flying boats for the Royal Air Force.

The Singapore Mk.III is a four-engined biplane flying boat suitable for long range, open sea reconnaissance and coastal patrol.

Of two-step type, the hull is specially designed to eliminate "porpoising" tendencies. Structurally it consists of frames, built to the shape of the hull, to which is attached the stiffened skin.

Four medium supercharged Rolls-Royce Kestrels of 525 h.p. provide the power, each pair being mounted in tandem. The



A considerable number of Supermarine Stanraer flying boats with 820 h.p. Pegasus engines is to be built for the Royal Air Force.



The Hart Trainer (525 h.p. Kestrel IB) is generally similar to the light bomber Hart, but has dual controls and no military equipment.

forward engines are of the III M.S. type (geared .477:1), and the rear two are of the II M.S. series with a gear ratio of .553:1.

Forward of the pilot's enclosed cockpit is a Scarff gun ring, and a similar mounting is provided amidships (this one is arranged to slide, permitting fire over both sides of the hull), and in the extreme tail, aft of the triple rudders.

The latest Short military flying boat to appear was actually the R.24/31 "gull wing" monoplane, commonly known as the Knuckleduster. With two medium supercharged Rolls Royce Goshawk engines of 720 h.p. this experimental boat made a top speed of 150 m.p.h. at 4,500 ft. Much experience, which should be of use in the planning of future monoplane boats, was gained with the R.24/31, which was reported to be delightful to fly and to have excellent handling and running characteristics on the water.

SUPERMARINE

PERHAPS the best-known product of the Supermarine Aviation Works (Vickers), Ltd., of Woolston, Southampton, is the Southampton flying boat which, after years of exemplary service with the Royal Air Force, is only now being replaced. The company has, however, three types of marine aircraft of modern design, all of which are in production or ordered for the Royal Air Force.

Smallest of these is the Seagull V amphibian biplane with 600 h.p. Pegasus engine. Actually the name Seagull V applies to the machine as supplied to the Royal Australian Air Force. As a deck landing fleet spotter for service with the R.A.F. it is to be known as the Walrus.

Certain units of the R.A.F. are now being equipped with the Scapa twin-engined flying boat—a biplane type with two 525 h.p. Kestrel III engines mounted beneath the top plane. A crew of five is carried in the Alclad hull, and the machine may be used for reconnaissance, bombing, torpedo transport and training.

The Stranraer, which is also on order, is a larger boat than the Scapa, has more internal accommodation, and a much higher performance. As supplied to the R.A.F. it will be fitted with 820 h.p. Pegasus X engines.

When required, heavy bomb loads can be carried, and the arrangement of the gun positions—there are mountings in the bows, amidships, and in the tail—ensures a complete defence, for there are no blind spots.

VICKERS

LARGE numbers of heavy bombers, troop carriers, general-purpose machines and torpedo bombers have been supplied to the Royal Air Force by Vickers (Aviation), Ltd., whose



A popular light training type is the De Havilland Tiger Moth (130 h.p. Gipsy Major).

works are at Weybridge, Surrey. The latest types to be delivered in quantity are the Vincent general-purpose machine and the Vildebeest torpedo bomber.

Very recently a contract has been placed by the Air Ministry for a number of Wellesley medium bombers. The Wellesley is a completely new design and of all-metal construction, duralumin being principally employed, and embodies throughout the geodetic principle of intersecting members, which is the subject of Vickers-Wallis patents. The wing is of an unusually high aspect ratio, tapered in both plan form and thickness, and is fitted with split trailing edge flaps and Frise ailerons. An inwardly retracting undercarriage is fitted, the wheels lying, when in the raised position, in wells let into the wing. Vickers oleo-pneumatic shock absorbers and brakes are included. The pilot is situated approximately over the leading edge, and has an exceptionally fine view. His cockpit is provided with a sliding transparent roof. A single Bristol Pegasus XVIII radial engine will be fitted to the production type Wellesley.

WESTLAND

THE general-purpose aeroplane is an exceedingly difficult type to design, but Westland Aircraft, Ltd., whose Wapiti and Wallace machines in this class are standard equipment in the Royal Air Force, has met with great success in their production. A large batch of the latter type is at present



The Avro 626 advanced trainer (top) has the 277 h.p. Cheetah engine and is a development of the Tutor (below) which is a trainer with the 215 h.p. Lynx IV C. engine.

under construction at the Yeovil, Somerset, works of the company, and several are already in service.

Among the duties which the Wallace can undertake are fighting, bombing, army co-operation, long-range patrol, training, and target towing. As originally put into service the Wallace had open cockpits, but the latest version has a complete protective arrangement for the pilot and observer.

In general layout the Wallace is a two-bay biplane with a split-axle undercarriage. The power unit normally fitted is the Bristol Pegasus of the Series I (555 h.p.), II (570 h.p.), or III (670 h.p.). One front gun is provided for the pilot, and the observer has a drum-fed weapon on a special mounting which allows full advantage to be taken of the cockpit enclosure system. Approximately 500 lb. of bombs forms the normal projectile load.

The Wallace is readily convertible to a seaplane by fitting twin floats of duralumin construction. Ski may be mounted if required for operation from snow or ice.

Arrangements have been made in the Wallace for the carriage of the heavy loads necessary for long distance patrols over the desert. Stowage is provided for a drinking water tank, additional fuel and equipment, engine tools, etc. Two special tanks, of 60 gallons capacity each, may be fitted, one beneath each lower wing, giving a total range of over 1,000 miles.

Among recent experimental types produced by the company are a single-seater fighter with shaft-driven airscrew; a general-purpose monoplane; and a two-seater fighter Pterodactyl.

BRITISH MILITARY AIRCRAFT

Dimensions, Weights and Performance Figures

Manufacturer and Aircraft.	No. of Engines.	Type of Engine.	Span.	Length.	Wing Area.	Tare Weight.	Gross Weight.	Maximum Speed.	Maximum Speed attained at	Service Ceiling.	Range.	Remarks.
			ft. in.	ft. in.	sq. ft.	lb.	lb.	m.p.h.	ft.	ft.	Miles.	
SINGLE-SEATER FIGHTERS.												
Armstrong Scimitar	1	Panther X.	33 0	25 0	261.35	2,814	4,100	212	9,840	28,200	420	Also available with supercharged Panther or Tiger. Developed from Service Bulldog. Adopted by R.A.F.
Whitworth.			10.06 m	7.62 m	24.27 m ²	1,276.3 kg	1,855 kg	342 km/h	3,000 m	7,986 m	676 km	
Bristol Bulldog	1	Mercury VLS.2	33 8	25 2½	293.6	2,810	4,100	225	15,500	30,550	500	Adopted by R.A.F.
Mk. IV.			10.25 m	7.68 m	27.27 m ²	1,274 kg	1,858 kg	360 km/h	4,728 m	9,310 m	800 km	
Gloster Gauntlet	1	Mercury VLS.	32 9½	26 2	300	—	3,950	230	15,800	35,500	—	Adopted by R.A.F.
			10.00 m	7.9 m	27.9 m ²	—	1,790 kg	370 km/h	4,820 m	10,800 m	—	
Gloster Gladiator	1	Mercury VIII.	32 3	27 5	323	3,234	4,450	260	15,500	35,000	—	Adopted by R.A.F.
			9.81 m	8.38 m	29.97 m ²	1,460.4 kg	2,019 kg	420 km/h	4,724 m	10,668 m	—	
Hawker Fury Mk. II	1	Kestrel VI	36 0	27 0	252.5	—	3,600	228	15,000	—	—	Adopted by R.A.F.
			7.94 m	8.24 m	23.45 m ²	—	1,635 kg	367 km/h	4,575 m	—	—	
Hawker Nimrod	1	Kestrel V	33 6½	27 0	298.5	—	4,050	206	14,500	—	—	Adopted by R.A.F.
			10.22 m	8.24 m	27.7 m ²	—	1,840 kg	332 km/h	4,420 m	—	—	
TWO-SEATER FIGHTERS.												
Hawker Demon	1	Kestrel V	37 3	29 4	348	—	4,490	202	15,000	—	—	Adopted by R.A.F.
			11.37 m	8.95 m	32.3 m ²	—	2,040 kg	325 km/h	4,575 m	—	—	
Hawker Osprey IV	1	Kestrel V	37 0	29 4	339	—	4,935	186	14,500	—	—	Adopted by R.A.F.
			11.29 m	8.95 m	31.5 m ²	—	2,245 kg	299 km/h	4,425 m	—	—	
ARMY CO-OPERATION.												
Hawker Audax	1	Kestrel IB	37 3	29 4	348	—	4,400	180	3,000	21,500	493	Adopted by R.A.F.
			11.37 m	8.95 m	32.3 m ²	—	2,000 kg	290 km/h	915 m	6,550 m	793 km	
Hawker Hector	1	Dagger III	37 3	29 4	348	—	4,470	185	5,000	—	—	Adopted by R.A.F.
			11.37 m	8.95 m	32.3 m ²	—	2,165 kg	306 km/h	1,526 m	—	—	
LIGHT BOMBERS.												
Hawker Hart II	1	Kestrel IB	37 3	29 4	348	—	4,740	170	3,000	21,600	524	Adopted by R.A.F.
			11.37 m	8.95 m	32.3 m ²	—	2,155 kg	274 km/h	915 m	6,583 m	840 km	
Hawker Hind	1	Kestrel V	37 3	29 4	348	—	5,300	200	15,000	—	—	Adopted by R.A.F.
			11.37 m	8.95 m	32.3 m ²	—	2,405 kg	322 km/h	4,575 m	—	—	
GENERAL PURPOSE.												
Hawker Hardy	1	Kestrel X	37 3	29 4	348	—	4,930	170	3,000	—	—	Adopted by R.A.F.
			11.37 m	8.95 m	32.3 m ²	—	2,240 kg	274 km/h	915 m	—	—	
Westland Wallace	1	Pegasus II.M.3.	40 5	34 2	448	3,880	5,750	160	5,000	24,100	470-1,120	Adopted by R.A.F.
			14.15 m	10.41 m	45.4 m ²	1,760 kg	2,609 kg	258 km/h	1,525 m	7,350 m	756 km-1,800 km	
MEDIUM BOMBERS.												
Boulton Paul Overstrand	2	Pegasus II.M.3.	72 0	46 2	1,000	7,936	12,000	153	6,500	22,500	550	Adopted by R.A.F.
Mk. I.			21.98 m	14.05 m	92.9 m ²	3,600 kg	5,450 kg	246 km/h	1,985 m	6,860 m	885 km	
Boulton Paul Superstrand	2	Pegasus IV	72 0	45 6	980	8,806	15,004	191	15,000	27,500	1,050	With C.P. Airscrews. Adopted by R.A.F.
			21.98 m	13.85 m	91.04 m ²	3,995 kg	6,805 kg	306 km/h	4,575 m	8,380 m	1,690 km	
Vickers Wellesely	1	Pegasus XVIII.	—	—	—	—	10,000	—	—	—	—	Adopted by R.A.F.
			—	—	—	—	4,536 kg	—	—	—	—	
HEAVY BOMBERS.												
Fairey Hendon	2	Kestrel VI	101 9	69 9	1,446	—	20,000	—	14,000	—	—	Adopted by R.A.F.
			31.01 m	21.26 m	134.3 m ²	—	9,072 kg	—	4,267 m	—	—	
Handley Page Heyford	2	Kestrel VI	75 0	58 0	1,470	—	—	150	14,000	—	920	Adopted by R.A.F.
			22.9 m	17.7 m	136.5 m ²	—	—	(approx.) 241 km/h	4,267 m	—	1,472 km	
T.S.R.												
Blackburn Shark I	1	Tiger IV	46 0	35 3	500	4,039	8,050	150	6,000	16,000	625	Adopted by R.A.F.
			14.03 m	10.75 m	46.5 m ²	1,830 kg	3,648 kg	241 km/h	1,830 m	4,885 m	1,005 km	
Fairey Swordfish	1	Pegasus III.M.3.	45 6	36 4	542	—	7,720	—	—	—	—	Adopted by R.A.F.
			13.87 m	11.07 m	50.35 m ²	—	3,502 kg	—	—	—	—	
COASTAL RECONNAISSANCE.												
De Havilland 89 (Conversion).	2	Gipsy Six	48 0	34 6	340	3,380	5,450	151	Sea level	17,100	+550-	Development of D.H. Rapide. Adopted by R.A.F.
			14.63 m	10.52 m	31.6 m ²	1,539 kg	2,474 kg	243 km/h	—	5,220 m	+885 km	
A. V. Roe Anson	2	Cheetah IX	56 6	43 3	410	4,826	7,650	188	6,000	19,500	475	Adopted by R.A.F.
			17.2 m	12.9 m	38.1 m ²	2,189 kg	3,470 kg	302 km/h	1,828 m	5,944 m	765 km	
BOMBER TRANSPORT.												
Armstrong XXIII	2	Tiger VI	88 0	80 9	—	—	—	—	—	—	—	Undergoing official tests.
Whitworth.			26.8 m	24.5 m	—	—	—	—	—	—	—	
Bristol 130	2	Pegasus III.M.3.	96 0	67 9	—	—	18,000	—	—	—	—	Undergoing official tests.
			29.26 m	20.6 m	—	—	8,164.6 kg	—	—	—	—	
Handley Page 51	2	Tiger VI	90 0	78 4	—	—	—	—	—	—	—	Undergoing official tests.
			27.4 m	23.87 m	—	—	—	—	—	—	—	
TRAINING.												
De Havilland Tiger Moth	1	Gipsy Major	29 4	23 11	239	1,115	1,825	109	Sea level	13,600	300	Adopted by R.A.F.
			8.95 m	7.32 m	22.2 m ²	506 kg	829 kg	175 km/h	—	5,150 m	482 km	
Phillips and Powis Hawk Trainer	1	Gipsy Major	34 0	24 0	169	1,150	1,900	150	Sea level	20,000	660	Adopted for Reserve Training. Developed from Miles Falcon. Adopted by R.A.F.
			10.36 m	7.32 m	15.58 m ²	521.6 kg	862 kg	241 km/h	—	6,096 m	1,060 km	
Phillips and Powis Night Hawk	1	Gipsy Major	35 0	25 0	174	1,650	2,400	150	Sea level	15,000	—	Adopted by R.A.F.
			10.66 m	7.31 m	16.16 m ²	748 kg	1,089 kg	241 km/h	—	4,570 m	—	
A. V. Roe Tutor	1	Lynx IV	34 0	26 6	300	1,800	2,600	122	Sea level	16,200	290	Suitable for complete Military Training. Adopted by R.A.F.
			10.36 m	8.08 m	27.87 m ²	816 kg	1,179.3 kg	195 km/h	—	4,940 m	467 km	
A. V. Roe 626	1	Cheetah V	34 0	26 6	300	2,140	2,798	130	Sea level	16,200	242	Suitable for complete Military Training. Adopted by R.A.F.
			10.36 m	8.08 m	27.87 m ²	971 kg	1,269 kg	209 km/h	—	4,940 m	389 km	
Hawker Hart Trainer	1	Kestrel IB	37 3	29 4	348	2,072	4,085	180	3,000	23,400	450	Adopted by R.A.F.
			11.37 m	8.95 m	32.3 m ²	1,347.1 kg	1,855 kg	290 km/h	915 m	7,150 m	725 km	
BOATS AND AMPHIBIANS.												
Saunders Roe London	2	Pegasus III	80 0	57 0	1,425	11,100	18,400	136	5,000	15,000	1,000	Adopted by R.A.F.
			24.5 m	17.4 m	132 m ²	5,035 kg	8,346 kg	220 km/h	1,525 m	4,570 m	1,609 km	
Short Bros. Singapore III	4	2 Kestrel III.M.S.	90 0	64 2	1,834	18,426	31,500	145	2,000	—	1,000	Adopted by R.A.F.
			27.4 m	19.52 m	170.5 m ²	8,360 kg	14,300 kg	233 km/h	610 m	—	1,609 km	
Supermarine Scapa	2	Kestrel III.M.S.	75 0	58 0	1,300	—	—	143	2,000	—	—	Adopted by R.A.F.
			22.85 m	16.2 m	121 m ²	—	—	230 km/h	610 m	—	—	
Supermarine Stranraer	2	Pegasus X	—	—	—	—	—	—	—	—	—	Adopted by R.A.F.
			—	—	—	—	—	—	—	—	—	
Supermarine Seagull V	1	Pegasus II, L.P.	—	—	—	—	—	—	—	—	—	Adopted by R.A.F.

COMMERCIAL AVIATION

— AIRLINES — AIRPORTS —



IN MINIATURE : One of the many interesting exhibits at the Empire Airway Exhibition, which will be opened to-day, is this model of the Short-Mayo composite aeroplane. Details of the exhibits were given in last week's issue of *Flight*.

THE WEEK AT CROYDON

A Question of Necessity : The Dublin Service : Abyssinian Ambulance : Infant Extradition : A Booking Anomaly

THERE was not much news of the big air companies last week, and from most of them there was only a tale of business as usual despite the bad weather. On Sunday, December 1, I noticed that K.L.M. ran a duplicate inward service, consisting of a full F.22 and a full F.12, with a total of about thirty-six passengers.

Wrightways tell me they have now used a P.B. automatic pilot on one of their machines for 150 hours with excellent results, and no adjustments to the device have been necessary.

Mr. Leo Crilly, of Crilly Airways, has just completed negotiations for the purchase of four Fokker F.12 machines from K.L.M. The first, painted in his colours of silver and blue, is to be delivered on December 20, and the rest shortly afterwards. They will be used on the London-Lisbon line mentioned elsewhere. Mr. Crilly, a business man and unused to perverse unreasonableness, has been both annoyed and amused by the mistakenly patriotic attitude of some people who have thrown back their ears and brayed at him for not "buying British." He has made superhuman efforts to do so, but British manufacturers of the types he needs are apparently too busy to deliver for a long time. What he is doing, he says, is to open up a British air line between England and her historic ally Portugal before someone else steps in and does it, and, in consequence, he does not expect to be brayed at.

What would be the personal attitude of these folk, he enquires, if they were asked to wait nine months for delivery of a British car, but could obtain a reasonably good

foreign one straight away? Would they lose their jobs because they lived too far from their work to walk?

As reported in last week's issue of *Flight* and elsewhere in this issue, Olley Air Service's plans are now complete for the Dublin link of a service between Liverpool, the Isle of Man, Belfast, Dublin and Bristol. Unlike many firms, Olley is not short of aircraft and will be able to commence the service with his present fleet. Usually, I understand, the Bristol-London link will be made by fast connecting trains, and this seems to be an interesting example of intelligent transport co-ordination. The train with which the service will connect takes two hours and lunch is served on board.

Olley's, by the way, had an ambulance case last Saturday from a boat at Marseilles (it had come from India) to Croydon. The pilot was "Sammy" Morton, and the passenger was Mr. K. Ladds, who had with him his wife and four-months-old baby.

There is more news concerning ambulance air work. In the Croydon hangars of Rollasons is a Dragon which is being completely rebuilt and, when ready, will be dazzling white with silver wings. On the fuselage and top wing will be large red crosses, and the Ethiopian flag will also be painted on the fuselage. Special drinking water tanks will be fitted and extra fuel tanks, too, together with all the other necessities of a flying ambulance.

The machine has been purchased by the Ethiopian Red Cross Society through the League of Nations' Red Cross Society, and when it is flown out for delivery to Addis Ababa by Flt. Lt. Hayter, Air Commodore Fellowes will

Commercial Aviation

go as representative of the League Society. I believe that the whole thing had been done by public subscription, and there is nothing to stop the public in this country from producing the money for another one. After all, we subscribe lavishly to all sorts of slightly absurd things, and there is sound common sense in assisting wounded men, who for lack of swift and comfortable travel facilities suffer incredible torments. Unless some newspaper takes it up and waxes hysterical about it, however, I suppose nothing will be done.

Companies with lines running to Germany are offering a 20 per cent. reduction of return fares for competitors, officials and holders of season tickets for the winter and summer Olympic Games.

A curious incident took place last week. A German film actor came in by K.L.M. from Berlin to take part in a British film, but had neglected to obtain a permit to work in this country. He was, therefore, not permitted to land, though instead of incarcerating him in the Airport police cells, according to the letter of the law, the emigration authorities at Croydon, who were courtesy and kindness personified, allowed the actor, who was accompanied by his mother, to go to the hotel for a glass of milk. The Home Office was telephoned about it and was adamant. The actor and his mother were to return to Berlin by the very next machine.

The idea behind all this seems to be that we have more than enough unemployed, actors included, and that the unauthorised appearance of a foreigner who is about to work in this country will probably take the bread out of some British mouth. I imagine some Home Office demi-god in wing collar, black silk tie and pearl pin deciding the fate of the presumptuous German film actor. And so, next day, on the morning K.L.M. service for Berlin, the actor departed with his mother from our hospitable shores. His name was Peter Bosse. His age, three years.

Across the Pacific

AFTER a long series of survey flights with a Sikorsky S.42 Pan American Airways have now reached their first definite objective—Manila—using the Martin *China Clipper* for the first time. The flight took 59hr. 47min., though this was expanded to six days in actual time, with an overnight stop at each island and a day's stop at Guam. From a calendar point of view a whole day was lost as the machine crossed the date line. At the moment of going to press the *China Clipper* had started on its return journey.

Aerodromes Advisory Board Wound Up

A STATEMENT has been issued by authority of the Secretary of State for Air stating that the Aerodromes Advisory Board has ceased to exist. This Board was set up in 1933 by the professional institutions principally concerned in the development of the groundwork of aviation, with the co-operation of the Air Ministry.

The Board, which was a purely voluntary organisation, carried out valuable work, particularly in respect of the provision, at a minimum cost, of advice on site selection and the drawing up of a list of qualifications necessary for those employed as consultants. When, in January, 1934, the question of making a survey of the British Isles was under consideration by the Air Ministry, it was decided that the Aerodromes Advisory Board would be the most suitable body to make recommendations. A programme of investigation was drawn up by the Board, on which they were prepared, if necessary, to carry out a survey.

The time has now arrived, the Air Ministry explains, for the State itself to deal with aspects of civil aviation which, in their earlier stages, had necessarily to be left to the goodwill of voluntary bodies. It has, in fact, been found necessary to institute machinery through which the Air Ministry can obtain the combined advice of all departments affected by civil aviation developments. For this purpose two strong inter-departmental official committees have been set up, one to advise on the best means of developing civil aviation inside Great Britain (under Sir Henry Maybury), and the other concerned with routes external to this country (under Sir Warren Fisher). Much of the work formerly performed by the Aerodromes Advisory Board will, therefore, be dealt with by these committees.

The managing director of British Continental Airways, which runs services to Amsterdam *via* Antwerp, to Brussels, and to Lille, tells me of an astonishing state of affairs which exists. His company, up against two powerful, old-established foreign firms on the England-Holland line, is severely handicapped because none of the big London travel agents may book for his firm, though both K.L.M. and D.L.H. obtain the bulk of their passenger bookings from these London agencies.

Thus, if an English passenger wishes to book by the only British firm operating between England and Holland, he will probably drop into one of the well-known West End travel agencies where they can sell him tickets on either of the foreign lines, but will be unable to do so for the British company. I am not concerned with the whys and wherefores of this matter. I merely record the fact as it is.

Telling the Passengers

K.L.M. has a new and not unattractive passenger pamphlet for travellers to the East, containing much sage and friendly advice about air travel.

Incidentally, the booklet contains the answer to various letters and articles in *Flight* and other papers, asking what steps air companies really take to study their passengers. An extract from one such letter ran as follows: "I wonder if any effort is made by air line companies to encourage comments and criticisms from clients." Well, the pamphlet concludes with "If you have the slightest cause for dissatisfaction, or if you can offer any suggestions for improving our organisation, we shall be genuinely pleased if you will let us know about it."

As a matter of fact, it is very rare for a machine to land at Croydon without an official of the company concerned asking some of the passengers if the journey and service given have been satisfactory. A. VIATOR.

New Maps for Old

IN its yearly report, the Ordnance Survey Office announces that a new aeronautical map of Great Britain, of roughly eight miles to an inch, has been begun. This has been designed especially for the use of pilots, and only the names of the larger towns will be found thereon. In all, the set will consist of fifteen sections, projected so as to form a continuation of the recently published French series.

Route Value in New Zealand

SOME interesting information has come to hand from New Zealand concerning the routes covered by the two services which, as already recorded, are now operating.

East Coast Airways, for instance, who use D.H. Dragons, operate between Napier and Gisborne four times daily in each direction. There is no rail connection between these places, and the journey takes about six hours by road as against one hour by air, so this service is already very popular.

The country covered by Air Travel (N.Z.), Ltd., on the west coast of the South Island, between Hokitika and Okara, is of such a nature that air travel is the obvious method. In this area roads and bridges are continually being washed away as a result of the tremendous rainfall. Naturally enough, the route is a mildly dangerous one from the point of view of forced landings, but this fact is balanced by the glorious scenery. Parallel to the actual route stretch the snow-covered Southern Alps, which rise to a height of 12,000ft., and on the lower slopes of these lie the magnificent rain forests, from which the country obtains most of her timber.

This air service, on which twin-engined machines may be used next year, has been a tremendous boon to settlers, and most of the large sheep-run owners have provided their own landing fields, where the machines call as required.

Since *Flight* published, in its issue of July 18, a map showing the projected air services of New Zealand, only one or two modifications and additions have been made. As recorded in *Flight* of November 21, New Zealand Airways, using single-engined Boeings, hope to operate between Timaru, Queenstown and Dunedin, in the South Island; Great Pacific Airways are not now expected to call at Palmerston North on their way between Auckland and Dunedin; and Cook Strait Airways may extend their service to Hokitika, thus linking up with that operated by Air Travel.

The Irish Service

IT appears that the Olley-cum-Irish Government service between Dublin and this country, details of which were given in last week's issue of *Flight*, will run, for a start, to Liverpool and Bristol, with London as a possible terminal later on. Balldonnel aerodrome will have D/F equipment in due course, and for this the Dail has voted a sum of £3,490.

The Lisbon Service

ALTHOUGH Crilly Airways have not yet entirely completed their plans, the Lisbon service, some details of which were given in *Flight* of November 7, will definitely start early in the New Year. Permission has, in fact, been obtained for a start, if possible, on January 1.

As already suggested, the company will use four Fokker F.12s, and a return service will be run every week-day with stops at Bordeaux and Madrid. Originally it was expected that the stopping places would be Nantes and Santander, but these have since proved unsuitable. The single and return fares between London and Lisbon will be £17 17s. and £32.

During the past six weeks Mr. Boss, a representative of the company, has been out in Portugal, and during the coming month survey flights will be made.

A Winter Service to Switzerland

FOR the first time Swissair will operate a winter service between England and Switzerland, starting on December 16, using Douglas DC2s. According to schedule the distance should be covered at 146 m.p.h. As the cruising speed of the Douglas is at least 170 m.p.h., the time-table should be easily kept even in case of head winds or bad weather.

Passenger comfort will be improved by an adequate thermostatically controlled cabin heating system, and the stewardess service—a feature introduced in Europe by Swissair—will be continued during the winter. Light refreshments will be served during the flight.

It has been shown that in case of fog around Croydon at least four other aerodromes in the vicinity of London will be servicable, namely, Gatwick, Gravesend, Manston and Lympne, where, of course, road transport facilities will be available. Of the two terminal aerodromes in Switzerland, Basle and Zurich, the latter has the Lorenz blind approach system, while the Douglas machines, of course, have the complementary equipment.

The new winter service will interest all English tourists who enjoy the Swiss winter sport season. It has been arranged that train connections will be available at Basle and at Zurich, so that all the popular resorts in the Bernese Oberland and in the Grisons can be reached the same evening.

The ground organisation for the new winter service will be in the hands of Imperial Airways, Swissair's general agents in Great Britain.

Improvements at Leicester

A £17,000 SCHEME for the re-planning of Leicester municipal airport has been approved by the General Purposes Committee of the Leicester City Council. Part of the money will be used in reorganisation of the night equipment. The segregation of the social side, represented by the Leicestershire Aero Club, and the commercial side will also be included in the scheme. Crilly Airways propose to establish a repair shop and pilots' headquarters on a part of the aerodrome to be leased from the Corporation.

Skye-ward

NORTHERN and Scottish Airways were due to open a new bi-weekly service to-day between Renfrew and Skye. Machines, says Mr. George Nicholson, the managing director of the company, will leave Glasgow at 9 a.m. on Tuesdays and Thursdays, and will leave Skye again at midday. The journey will take about two hours each way, and the fares are £3 5s. single and £6 10s. return.

Control Changes at Heston

AIR Ministry traffic control is responsible for some important alterations now taking place in the Heston control tower. Formerly the look-out man occupied the whole of the "top storey," which has an uninterrupted view in all directions. Upon him devolved considerable responsibility, sometimes demanding quick decisions with no time to consult the control officer, who occupied the lower room with a restricted view of the aerodrome.

The entire control room is now being moved bodily into the top of the tower, where the control officer will be able to deal instantly with any situation which may arise. The radio operator's box is also being moved to the upper room, and the old "drag-band" message conveyer is to be replaced by a Sturtevant tube pneumatic conveyer, leading, as before, to the teleprinter operators below. The switchboard controlling floodlights, obstruction and boundary lights, which was formerly housed inside the control room, will now be outside, directly under the hand of the look-out man.

An interesting detail is the system of sending, receiving and recording messages to and from aircraft, which is used at Croydon and has now been started at Heston. Upon small, variously coloured printed slips, each with a carbon copy, are written the times of departure or arrival, messages exchanged, weather and bearings asked for and so on. These are handed by the control officer to the radio operator, or vice versa. The international "Q" code is used. The coloured slips, each representing the complete history of any one flight, are finally assembled and docketed for future reference. The system eliminates the spoken word, with its risk of error or misinterpretation, and it reduces to a minimum the actual writing to be done, for it replaces the old elaborate traffic record where every detail had to be written in longhand by the control officer on one large daily sheet.

RECEPTION: Miss Jean Batten arrives at Rio de Janeiro. In the group, which was taken immediately after she had landed her Percival Gull, is Col. Ivo Borges, Commander of the Military Aviation School (third on the right from Miss Batten), with Mr. Edwin E. Hime, Jr., Gipsy engine representative in Brazil, immediately behind and to his right. Seated on the left is Capt. Aquiro, who found Miss Batten after her forced landing.



WHEELS over WATER



Flotation Gear Reviewed. Part I : What Happens When an Aeroplane is "Ditched" : Typical Installations on Fleet Air Arm Machines

By H. F. KING

SO long as aircraft carriers retain the form in which they are known to-day there will be landplanes operating with the Fleet. Officially such a machine is called a ship-plane; but, in spite of the nautical nomenclature, an engine failure over water entails a "ditching" quite as undignified as that of a common club trainer whose closest association with the sea is normally a Sunday morning *strafe* of Clacton beach.

After the "ditching" has been effected, however, the resemblance ends, for the Fleet machine, with such contingencies in view, will have been fitted with flotation gear, enabling it to remain on the surface of the water for a long period of time. The landlubber aircraft, unless its structure were of a particularly buoyant nature (large wooden wings, for example, can make extremely efficient "floats") would soon become waterlogged, finally to disappear into Davy Jones' locker.

Raison d'Etre

The possibility of engine failure and like trouble is not the only reason for the provision of flotation gear. An aircraft carrier is an extremely vulnerable target, and, should her flying deck be wrecked by enemy shells or bombs, her brood, unable to land-on, would, in all probability, be forced to descend into the sea when fuel gave out.

The story of the development, testing and use in emergency of flotation gear is, as might be imagined, by no means void of excitement. In order to try out a new gear it is customary to shoot an old airframe or mock-up, suitably ballasted, from a catapult—more often than not one of those on board H.M.S. *Pegasus* (late *Ark Royal*).

Four or five thousand pounds of aeroplane striking the sea at sixty miles an hour creates a superb spectacle, particularly in the eyes of those folk who derive intense pleasure from the summary destruction of expensive material. When the spray clears, officials can see if the gear warrants its name.

A number of "live ditchings" have also been made in recent years, mostly by pilots attached to the Marine Aircraft Experimental Establishment, Felixstowe. The procedure is for the pilot to endeavour to make as safe and

normal a landing as possible. He gets the tail of his machine well down for a three-pointer, the wheels skim the water and then dig themselves in. Should the machine be a small and comparatively fast-landing one, it is almost certain to turn a somersault and come to rest in an inverted position. The heavier two-seaters and larger types usually tip up on their noses and then fall back again into the water the right way up.

A story is told of one "live ditching" in which a Hawker Osprey behaved in this fashion, whereupon the pilot released the little collapsible dinghy which is normally carried on these machines, stepped into it and paddled himself across to a pinnacle which was standing by—all without so much as getting his toes wet.

The Somersault

When a machine does turn turtle during a fairly high-speed "landing," it is surprising how little of it enters the water before it comes to rest on its back; just a part of the wheels and a portion of the nose—little more than the spinner.

The undercarriage, of course, is mainly responsible for the "bucking" experienced on hitting the water. Some of the machines operating with the U.S. Navy are fitted with retractable undercarriages—notably the Grumman two-seaters and the later type of Curtiss bomber-fighter. When the wheels are retracted on these machines a comparatively smooth "belly" is left beneath the fuselage and doubtless reduces the hazard of an alighting on the sea. The French Navy for many years past has had machines on which the undercarriages are arranged so that they may be released before an alighting is made on the water. These have, in addition, a bottom to the fuselage similar to that of a flying boat.

When Felixstowe wanted to ascertain the floating properties of the Blackburn M.1/30A torpedo bomber some time ago (this machine, like the Shark T.S.R. now in service with the Fleet Air Arm, had a watertight monocoque

The heading picture shows a Nimrod which, fitted experimentally with wing flotation bags, has overturned on being "ditched." Nimrods do not normally carry the type of gear shown. R.A.F. Official—Crown Copyright Reserved.

These views show how, on the machine being "ditched," the Youngman dinghy fitted to this Fairey IIIF bursts from its box—having been automatically inflated—and, as the aircraft sinks, gradually takes the weight. This particular IIIF has fuselage bags in addition to the dinghy.

R.A.F. Official—Crown Copyright Reserved.

fuselage) they dropped it from the big crane normally used for handling flying boats.

The Shark, incidentally, is one of the few types employed by the R.A.F. whose structural peculiarities obviate the provision of flotation gear. The fuselage is a watertight monocoque structure and is completely buoyant. Should the actual cockpits become flooded in a rough sea the closed compartments at the front and rear of the fuselage have a buoyancy 30 per cent. greater than that required to float the machine fully loaded; the torpedo or bomb load is assumed to have been released before the descent has been made into the sea. The Shark also has stowage for an inflatable dinghy aft of the rear cockpit. Salvage cables from the tail and centre section are also provided.

A few weeks ago a pilot had occasion to "ditch" his Shark while a torpedo was in place below the fuselage. Normally, of course, the projectile load is jettisoned before a forced descent. In this particular instance, however, the Shark turned turtle and came to rest submerged with the "mouldy" poking its snout above the surface.

The new Avro Anson reconnaissance monoplane is another Service type which, although intended for over-water operation, does not carry flotation gear. Its wooden cantilever wings can be depended upon to keep it afloat for some hours, and the crew is supplied with a collapsible dinghy.

There is considerable variation, in principle and detail, in the gear which equips the R.A.F. This can be explained to advantage with reference to various installations. The machines concerned are, in the main, of more or less conventional construction with metal or composite framework and fabric covering. The gear with which they are fitted can conveniently be divided into the following categories: (1) Atmospheric bags in the fuselage, (2) Youngman dinghy, (3) Youngman dinghy and tail bags, (4) Inflatable bags in the fuselage, and (5) Similar bags in conjunction with atmospheric bags.

As their designation implies, atmospheric bags contain air at atmospheric pressure. They are manufactured from rubberised fabric, and are laced to adjacent structural members. It is necessary, of course, to vent the bags to the atmosphere; otherwise, during a high-altitude flight, the difference in pressure between the outside air and that in the bags would tend to burst them. The vent pipe is led forward along the fuselage to the region of the engine mounting, and, on immersion, acts as a water seal. It depends on the nature of the structure whether one or more bags are supplied. Suitable provision is made, of course, for the cross-bracing wires of the fuselage.

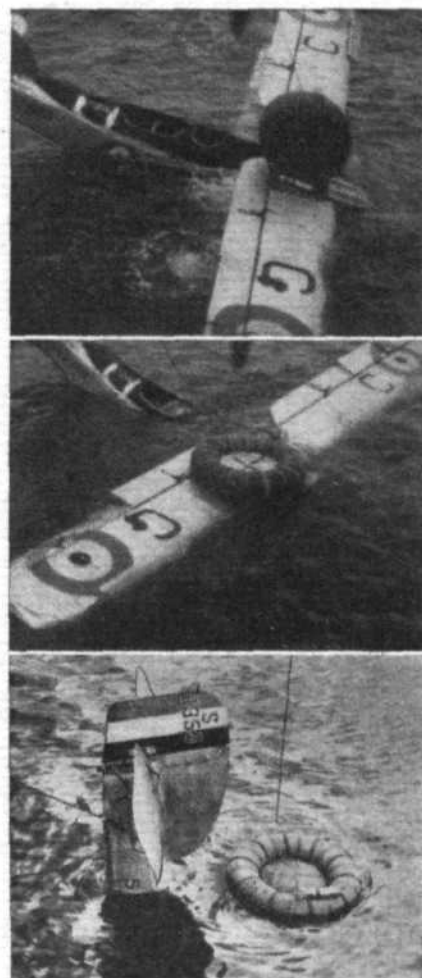
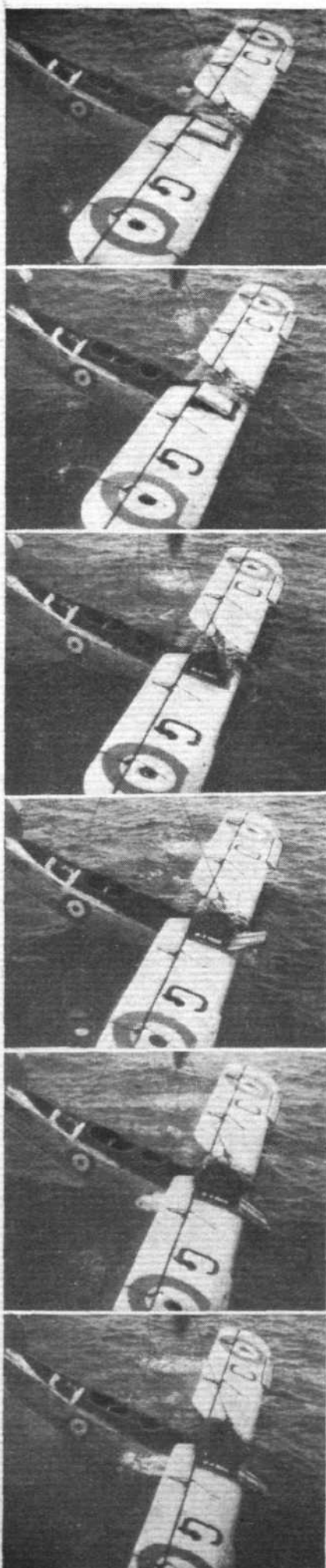
Types Equipped

Atmospheric bags are carried, often in conjunction with some other gear, in the Hawker Nimrod Fleet fighter, Vickers Vildebeest torpedo bomber, Fairey Seal Fleet spotter reconnaissance type, Fairey Swordfish torpedo spotter reconnaissance machine, and the Blackburn Baffin torpedo bomber.

In the Nimrod there are four of these bags located in the rear portion of the fuselage. That nearest the cockpit is a small triangular one, and the remaining three are roughly cube-shaped. In addition, there is a flotation box in each of the top main planes. These wooden watertight boxes lie between the two spars and do not interfere with the contour of the wings. Incidentally, the latest Nimrods of the Mark II type are provided with a small emergency dinghy, triangular in shape, which is stowed in the top starboard plane.

The Vickers Vildebeest has three bags in the rear fuselage in addition to a fourth large bag which, when inflated, occupies most of the air gunner's bay.

On the Fairey Seal two bags are placed in both front and rear fuselage, while a fifth, and smaller, bag fits beneath the pilot's seat. An emergency dinghy is stowed in the second drag bay of the top plane.



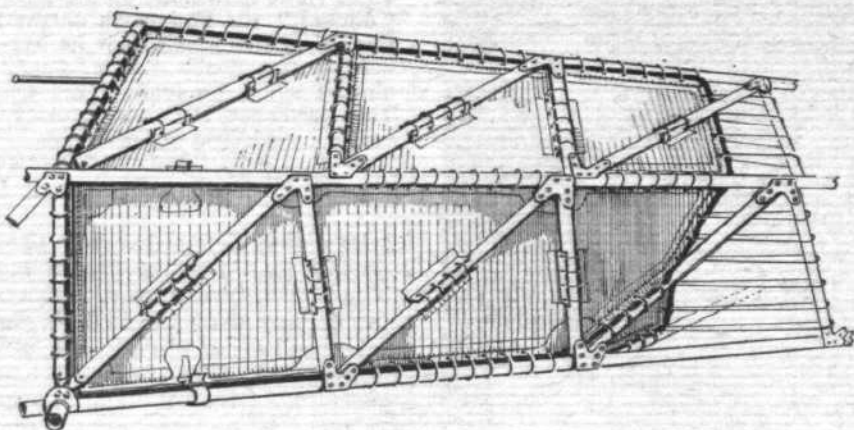
The rear portion of the fuselage of the Fairey Swordfish, the latest T.S.R. type to be adopted for service with the Fleet Air Arm, contains one large atmospheric bag which provides flotation in conjunction with a Youngman dinghy. Of the latter, more anon.

Atmospheric bags are carried in every bay but one of the rear fuselage portion of the Blackburn Baffin. Owing to the fact that this machine is fitted with a radial engine instead of with a water-cooled type, as was its predecessor the Ripon, which was basically similar in design, it was found possible to install yet another bag in the extra bay left through the installation of the radial.

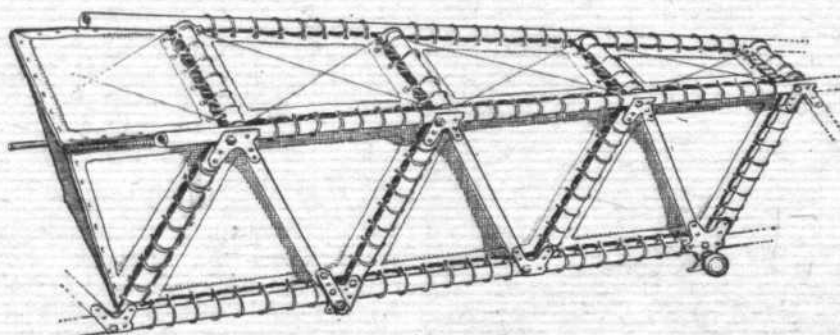
The large inflatable bag in the Vickers Vildebeest is an interesting installation. During flight it is carried folded from a metal tray level with the top longerons in the rear cockpit. Inflation is effected by carbon dioxide gas, and when this has taken place the bag occupies the space immediately below the tray extending fore and aft and taking up most of the air gunner's bay. If he stands upright at the rear of the cockpit he will not be trapped by the inflation of the bag, but, should he be occupying the seat immediately behind the pilot's cockpit, he must retire to the gunner's position either by the interior passage way, or by climbing over the top of the fuselage.

Means for both automatic and manual operation are provided, the latter taking the form of a wire connected to a handle which is easily accessible to the pilot. On certain machines another toggle is led back to the tail. The system of automatic operation is highly ingenious and has been developed by the Walter Kidde Company, Ltd., of Montague Avenue, London, W.7. In addition to being used for operating the Vildebeest bag, similar gear is employed for inflating the Youngman dinghies which are being fitted to a number of new types now entering the Service.

In general layout the system is similar in all cases. A lightweight cylinder containing carbon dioxide in liquid form is stowed, in the case of the Vildebeest, in the forward portion of the fuselage. This is sealed off by a copper disc which is gold-plated to prevent corrosion. Screwed on to the cylinder is an automatic head which is operated



The atmospheric bag in the rear of the fuselage of the Fairey Swordfish T.S.R. machine



This installation of atmospheric bags is in the Hawker Nimrod fleet fighter

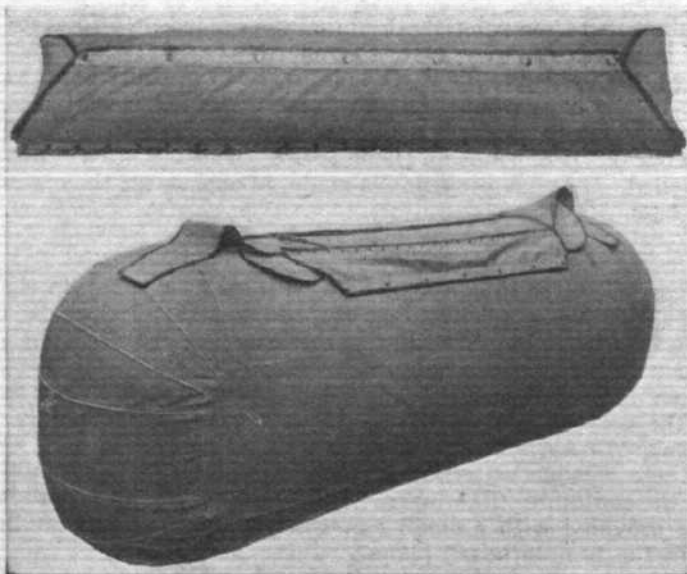
by pressure obtained by the immersion of two independent actuators. In all machines, whether there is a bag or a dinghy to be inflated, one of these actuators is mounted in as low a position as possible on the machine (usually on an undercarriage strut) while its twin is led as far forward as is convenient; in most instances this means that it is on an engine bearer. These actuators are merely tubes of about $\frac{7}{8}$ in. diameter with a small T piece attached to their lower end to overcome the possibility of pressure building itself up in the actuator during flight. When either of the actuators is submerged in water to a depth of twenty to twenty-four inches the pressure works, by way of piping, on a diaphragm, exerting movement through a train of levers which are holding a spring-loaded piston in compression. This piston terminates in a cutter which advances through the sealing disc allowing the gas to escape through the automatic head, by way of copper piping, to the bag or dinghy which is to be inflated.

High-pressure Inflation

The carbon dioxide is stored in a sealed bottle at a pressure of about 740lb. per square inch. The sealing disc of the bottle also acts as a safety valve and bursts at a pressure of 2,700lb. and at a temperature of 145 deg. F. The cylinder, incidentally, is tested to a pressure of 3,360lb. per square inch. It is arranged, however, that should the gas leave the bottle because of high temperatures, it will not be passed to the dinghy or bag, but vented to atmosphere.

In all the latest installations of such gear, at least in cases where it is employed to inflate a Youngman dinghy, a balance pipe is provided. It will be appreciated that, under diving conditions, there will be a very considerable variation in the pressure present in the box in which the dinghy is stowed. In fact, it was found recently that during a dive from 9,000ft. to 2,000ft. there was a pressure variation in the box equal to about 30 inches of water. The balance pipe is supplied, then, so that at no time can a vacuum be formed.

(To be concluded next week.)



A cockpit bag is carried on the Vickers Vildebeest torpedo bomber. It is normally stowed in the top portion of the fuselage but is inflated automatically when the Vildebeest enters the water

HERE and THERE

Third-party Insurance

THE Royal Aero Club announces that it has forwarded to the Air Ministry its recommendations on the draft clauses for a Bill amending the Air Navigation Act, 1920.

These recommendations have been reached after consultation with representatives of the Private Owners' and Air Touring Committee of the Club and the General Council of Associated Light Aeroplane Clubs.

Mr. Robert Blackburn's Loss

READERS will join us in extending sincerest sympathy to Mr. Robert Blackburn, chairman and managing director of the Blackburn Aeroplane and Motor Co., Ltd., whose 16½-year-old son, Robert, lost his life in a road accident last Friday.

Alvis Aero Engines

AN extraordinary general meeting of the Alvis Car and Engineering Co., Ltd., is being held on December 10 for the purpose of increasing the ordinary share capital. The firm has entered into an agreement with Société des Moteurs Gnome et Rhone whereby the British rights of these well-known French engines are acquired by the Alvis company. The experience of the French firm, and also any future improvements, will be placed at the disposal of the British company.

For Models Enthusiasts

AS announced last week, the monthly models page of *Flight* will appear in next week's issue, December 12. It will include a description of a model "Pou-du-Ciel."

About Air Mails

A Chronology: "Aero Field" Handbook No. 4 (Francis J. Field, Ltd., Sutton Coldfield, Warwick, 3s. 6d.)

ANYONE interested in British air mails—be he a philatelic collector or otherwise—will find an abundance of information on this subject in the *Aero Field Handbook No. 4, British Air Mails*, just published. This book is in the form of a chronology of every known event that can be traced concerning aerial message carrying from 1784 up to the present year. It therefore includes references to the pigeon, balloon, airship and rocket despatches, and message-carrying flights sponsored by private individuals, as well as to the "official" mail flying activities utilised or sponsored by the postal authorities—which, by the way, with the exception of the participation of the British Post Office in the French balloon post during the Siege of Paris period (1870-1871), and the experimental service between London and Windsor in 1911, were unknown until 1918.

Many illustrations, comprising photo-reproductions of typical "covers," stamps and aircraft, and diagrams of cachets, post-marks and maps of routes, are included to supplement the 402 references to British air mails.

Two Aeronautical Diaries

TWO very practical diaries for 1936 have just been published by Gale and Polden, Ltd. (Aviation Dept.), 2, Amen Corner, London, E.C.4. One is an R.A.F. diary and the other of a general aeronautical nature. Ten per cent. of the cost price of each copy of the latter sold is handed over to R.Ae.S. endowment fund. Prices are 1s. 6d., 2s. 6d., and 6s., according to binding, etc.

About Retractable Undercarriages

DURING his very interesting lecture to the R.Ae.S. last Monday, Mr. G. H. Dowty laid down no fewer than nineteen desiderata which he suggested should be kept in view when designing retractable undercarriages. That gives some idea of the complexity of the subject. The lecture was a very long one, and the subject was dealt with exhaustively. Although in his introduction the lecturer had a dig at British designers for their tardiness in adopting the retractable undercarriage, he admitted in his concluding sentences that he had in mind some definite cases where the installation of a retractable undercarriage would be a reckless extravagance. Mr. Dowty dealt with almost every known type of retractable undercarriage, and illustrated his lecture with slides showing the many different methods adopted.

A "Biggest Yet" International Week-end

THE Royal Aero Club announces that it is proposed to hold an international rally during the week-end July 23-26, in which foreign private owners will be invited to take part as the guests of the Club and of British private owners generally.

The arrangements are in the hands of the private owners' and hospitality committee appointed by the Club, and the suggested programme of the rally includes visits to Oxford, Cambridge, and the Isle of Wight, finishing with an official banquet in London on Saturday evening, July 25.

The foreign guests will be accommodated in a London hotel during the whole period, and the visits mentioned above will be made by air daily from Heston.

In view of the hospitality so generously accorded to air tourists on the Continent, it is considered desirable that the foreign guests should be under no expense whatever during their stay in London, and the cost of this hospitality will be met by a fund which it is proposed to raise amongst British private owners, the Royal Aero Club, and others interested.

It is hoped to make this rally the greatest gathering of European owner-pilots that has been achieved so far.

The committee of the R.Ae.C. is particularly anxious that the list of guests should be as representative as possible, and, therefore, British private owners who have been abroad and have suggestions to make on the subject of invitations are asked to communicate with the secretary, Commander H. E. Perrin.

Forthcoming Events

Club Secretaries and others are invited to send particulars of important fixtures for inclusion in the list.

- Dec. 5. R.Ae.S. (Students' Section) Lecture: "Boundary Layer Theory," by Mr. H. Leaderman, 7 p.m., 7, Albemarle Street, London, W.1.
- Dec. 6. Hampshire Aeroplane Club: Tenth Annual Dinner and Dance, South Western Hotel, Southampton.
- Dec. 6. Contractors' Dinner, Martlesham Heath.
- Dec. 13. R.Ae.S. (Students' Section): Informal Supper, 9 p.m., Ship Inn, Gate Street, Kingsway, London.
- Dec. 16. R.Ae.S. Lecture: "Wireless and its Application to Commercial Aviation," by Capt. J. M. Furnival, 6 p.m., Institution of Electrical Engineers.
- Dec. 19. R.Ae.S. (Coventry Section) Lecture: "The Stratosphere," by Capt. J. Lawrence Pritchard, 8 p.m., Armstrong Siddeley Canteen.
- Dec. 20. London Aeroplane Club: Annual Ball, Park Lane Hotel, London.
- Dec. 21. Brooklands Aviation Ltd.: Annual Dinner, 1936.
- Jan. 16. R.Ae.S. (Coventry Section) Lecture: "Development in Centrifugally Cast Piston Rings for Modern Aero Engines," by Mr. P. R. Twigger, 8 p.m., Armstrong Siddeley Canteen.

- Jan. 22. Royal United Service Institution Lecture: "The Expansion of the Royal Air Force," by Air Marshal Sir C. L. N. Newall, at 3 p.m.
- Jan. 30. and 31. Aerodrome Owners Association: Annual Conference and Aerodrome Equipment Exhibition, British Industries House, Marble Arch, London.
- Feb. 12. Yorkshire Aviation Services Country Club: Dinner and Dance, 8 p.m., Grand Hotel, Harrogate.
- Feb. 20. R.Ae.S. (Coventry Section) Lecture: "Variable-pitch Propellers," by Mr. T. E. Beacham, 8 p.m., Armstrong Siddeley Canteen.
- Feb. 28. Bristol and Wessex Aeroplane Club: Annual Aviation Ball.
- Mar. 10. Royal United Service Institution Lecture: "The Development of Civil Aviation," by Lt. Col. F. C. Sheldermine, at 3 p.m.
- Mar. 19. R.Ae.S. (Coventry Section) Lecture: "Type-Testing an Aircraft," by Flt. Lt. Bulman, 8 p.m., Armstrong Siddeley Canteen.
- April 16. R.Ae.S. (Coventry Section) Lecture: "Aircraft Instruments," by Mr. J. E. Chorlton, 8 p.m., Armstrong Siddeley Canteen.
- May 15—June 1. Stockholm Aero Show.

COMPONENTS, MATERIALS and ACCESSORIES

AS is to be expected in the case of a component which is virtually the heart of an aeroplane, the engine involves the use of a large number of very important accessories, and British manufacturers have not been backward in providing engine builders with a wide and altogether excellent choice of proprietary equipment.

To start with carburation—a word with which the name of H. M. Hobson (Aircraft and Motor) Components, Ltd., is almost synonymous. As is well known, this company has developed to an extremely high degree its system of automatic control. Every British super-charged engine is equipped with automatic boost control, a Hobson device which automatically prevents a safe boost pressure being exceeded, and also allows extra boost pressure for take-off to be safely attained. There is also the automatic mixture control for altitude, and, to supplement this, the Hobson pilot's cockpit throttle control, which, by an interlocking system, ensures that the pilot is unable to obtain full power on the weak automatic mixture, and also provides that the mixture control lever will be returned to the rich automatic position whenever the throttle is closed for a dive, so as to ensure positive pick-up when making a landing. Ultimately every Service engine in England will be fitted with this "robot" scheme.

The production of precision components for engines, such as crankshafts and camshafts, is the speciality of the Weyburn Engineering Co., of Elstead, Surrey. Their products have played a part in many recent successful record attempts.

Turning now to electrical equipment, we have the wide range of components

A Section Indicating the Vast Choice Offered to Constructors and Operators

made by Rotax, Ltd., of Willesden Junction, London, N.W.10. This includes magnetos, direct-cranking electric starters, and engine-driven generators in a number of different sizes, while there is also an extensive selection of navigation lights, interior lights, and a landing light for fitting in the leading edge of a wing. In addition, Rotax make switchgear and batteries to Air Ministry specifications. Switchgear and lighting accessories are also produced by D. H. Bonnell and Son, Ltd., of Osnaburgh Street, London, N.W.1.

Push-button Starting

Magnetos in types suitable for engines with from two to twenty-four cylinders are made by B.T.H., Ltd., of Rugby; they also make hand-starter magnetos and various types of electric starters and electrically driven compressors for use with air or gas starters. The company also manufacture electric turning gear operated in conjunction with a trembler coil, thus providing a "push-button" method of starting.

While on the subject of starting equipment, there is the auxiliary engine of A.B.C. Motors, Ltd., of Walton-on-Thames, a 4 h.p. flat-twin intended for

installation in large aircraft of all types, this little unit will not only operate an air compressor, but will also drive three or four other units installed in the same aircraft.

Dagenite accumulators, specially designed and built to Air Ministry specification by Peto and Radford, 50, Grosvenor Gardens, London, S.W.1, are now being fitted as standard equipment by most of the leading British manufacturers of civil aircraft. Nor does anyone need to be reminded of the name of Exide (Chloride Electrical Storage Co., Manchester), where accumulators are concerned.

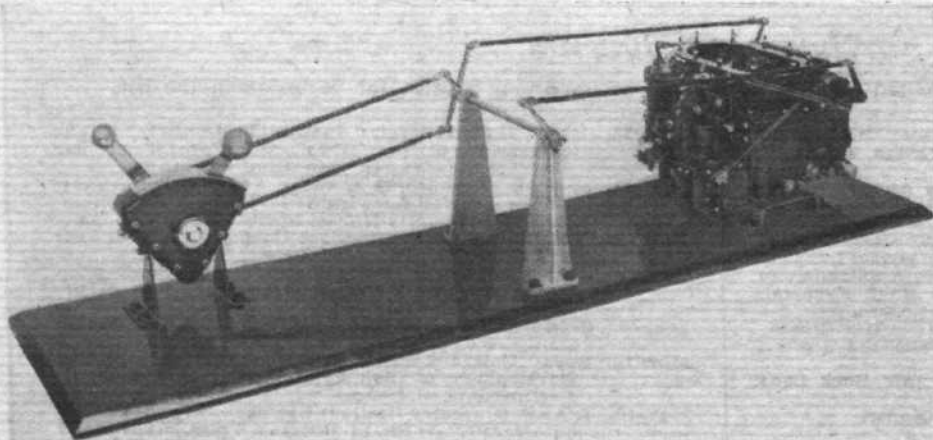
In the matter of those very specialised components, sparking plugs, we have the K.L.G. Co., of Putney Vale, London, whose products have played such an important part in many flying achievements. They make a range of plugs in the 12 mm., 14 mm. and 18 mm. sizes to meet all aero engine requirements, and there is also a selection of radio-screened terminals. In addition, the firm make sparking plug-testing and maintenance equipment.

Lodge Aviation Plugs (Lodge Plugs, Ltd., Rugby), are made in thirteen different types, in the 12 mm., 14 mm., and 18 mm. sizes, and an interesting new "line" is a 14 mm. plug, the detachable inner sleeve of which is so designed that it can be inverted and used to provide an alternative seating in the plug body; this plug is of the screened type.

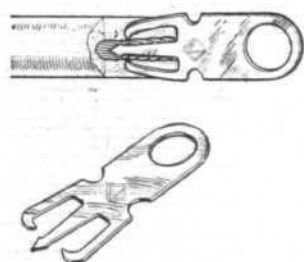
Terminal Simplicity

A minor sparking plug accessory which is of interest is the new patent Perfix terminal; it has three prongs, the centre one of which is pushed into the core of the cable and the outer two of which are closed in through the insulation to meet the centre prong; no soldering is necessary. The Perfix terminal is handled by Airco, of 18-20, Lower Regent Street, London, S.W.1.

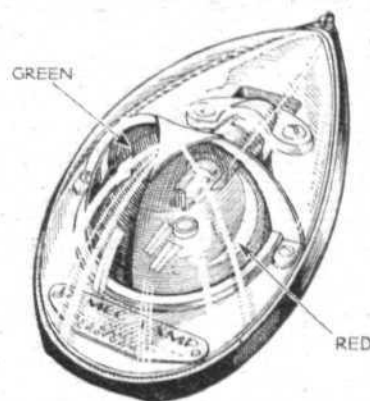
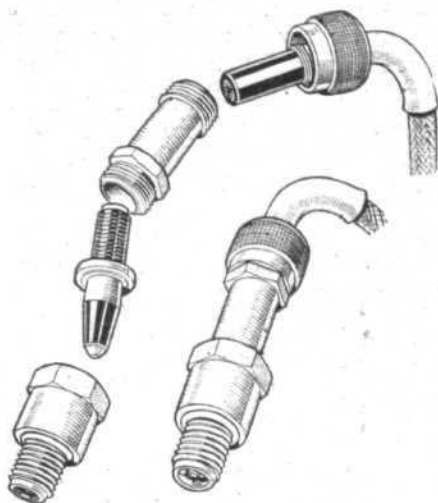
"Electrical equipment" covers a wide field and, departing for a moment from the engine side, it is necessary to mention such items as landing lights, which are gaining increasing importance with the growth of night flying. In this connection there is the well-known Harley light, which is made in fixed and retractable patterns; it is handled by Smith's Aircraft Instruments, Cricklewood Works, London, N.W.2. Vickers-Armstrong, Ltd., also make a landing light in the exterior and interior patterns, while Mr. F. J. A. Cameron, of 2, John Street, London, W.1, is concessionaire for the American Grimes landing light. These last three accessories were described in *Flight* of November 21, June 27 and November 7 respectively.



The Hobson Pilot's Cockpit Control, coupled by means of a bus-bar to one of the latest Hobson carburettors, on which is mounted the variable Datum Boost Control and Hobson-Penn two-stage Automatic Mixture Control.



(Above) The simple Perfix ignition terminal referred to on page 602. (Centre) The new Lodge screened plug, the central threaded portion of which is reversible to provide an alternative seating. (Right) Demec navigation lamp, by Mechanism, of Croydon.



Navigation lights are a speciality of Mechanism, of Croydon; an example of one of their "Demec" products is illustrated on this page.

Returning to engine components proper, we come to fuel pumps, five types of which are made by Amal, Ltd., of Perry Barr, Birmingham, 20. This firm, incidentally, is also well known for its jet-calibrating machines, flowmeters, and intake flame traps.

Designing them for engines up to 300 h.p., Tecalemit, Ltd., of Brentford, Middlesex, the well-known lubrication specialists, make ultra-lightweight diaphragm-type fuel pumps, while filters for fuel and oil are another of their many products. Many leading engine manufacturers are now using the Auto-Klean filter, made by Auto-Klean Strainers, Ltd., of Tower House, Trinity Square, London, E.C.3; ease of maintenance is a special feature.

The A.C. Sphinx Co., of Dunstable, Bedfordshire, also make fuel pumps, the "B" type as fitted to Pobjoy, Cirrus Hermes and De Havilland engines, and the "Y" type as used on the Carden Ford unit.

Rotherham and Sons, Ltd., of Coventry, make literally hundreds of different small parts, mainly of the nature of

pipe-line fittings, fuel taps, unions, etc.

Intake air filters are a product of C. G. Vokes, Ltd., 95-97, Lower Richmond Road, London, S.W.15. If desired, they can include warming units. Vokes filters are being used on Armstrong Siddeley engines, and the whole of the South African Air Force is being equipped with them. This company is also responsible for an exhaust silencer from which most satisfactory results have been obtained.

Radiation

Among the firms specialising on the cooling side are Serck Radiators, Ltd., of Warwick Road, Birmingham, 11, whose radiators for water and oil are made throughout in the works, beginning with the solid billet from which the tube is extruded. Lightness is a feature of the well-known Robertson coolers, made by Robertson Coolers, Ltd., 211A, Acton Vale, London, W.3; their R.H.5 oil cooler, as fitted to the Blackburn Shark, weighs only 11½ lb. No mention of oil coolers would be complete without the Vickers-Potts, a fitting which has been in wide use over a number of years.

In addition to manufacturing oil coolers, Gallay, Ltd., of Scrubbs Lane, Willesden, London, deal with all kinds

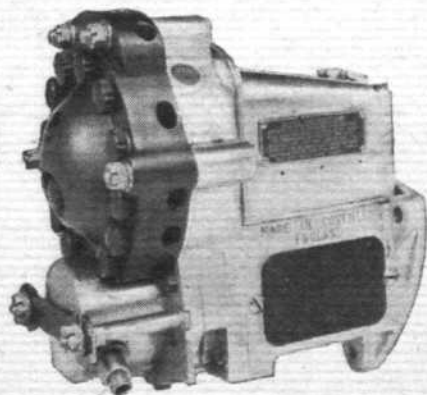
of sheet metal work and make tanks as well as radiators.

Needless to say, bearing design plays a most important part in the modern engine, and there can be practically no type of ball- and roller-bearing which the Ransome and Marles Co., of Newark-on-Trent, cannot supply. Another world famous maker of bearings is the Hoffmann Manufacturing Co., of Chelmsford, while the Skefko Ball Bearing Co., Ltd., of Luton, are widely known for their ball and roller bearings, both for engines and other mechanism in general.

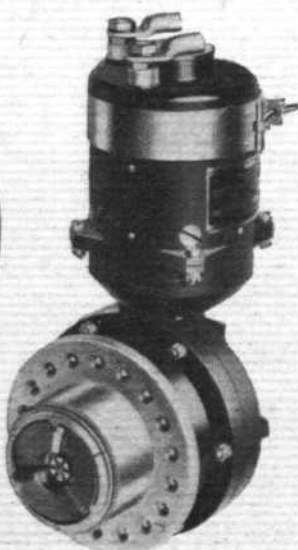
In addition to the patented bearings for which they are well known, Silent-bloc, Ltd., make "Floatex" engine mountings.

Specialoid, Ltd., of Friern Park, London, N.2, have manufactured aero engine pistons for a number of years, and are thoroughly conversant with A.I.D. requirements; Y. and R.R. alloys are employed.

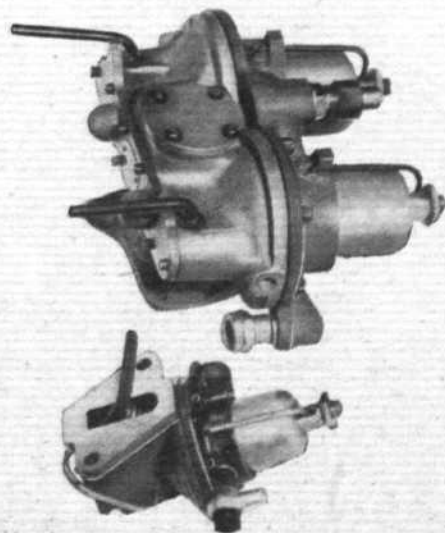
A wide variety of piston rings is made by the Aero Piston Ring Co., Ltd., Blackpool Street, Leeds, 10; the British Piston Ring Co., Ltd., Holbrook Lane, Coventry (who have developed a special material, Brilybdenum, to Air Ministry Specification D.T.D. 277); and Wellworthy, Ltd., 89, Blackfriars Road, London, S.E.1, who are making aircraft rings from Thermocrom. Pistons (in Y alloy), gudgeon pins and "Aero Vacrit" piston rings are manufactured by Hepworth and Grandage, Ltd., of Bradford.



(Above) B.T.H. polar inductor magneto for twelve-cylinder engines. (Centre) Rotax Eclipse direct-cranking electric starter, Type Y150.



(Right) Two examples from the Amal fuel pump range—the single-type Series 120, showing the rocker drive, and (top) the Duplex type which delivers 400 pts/hr.



Valve springs—and, for that matter, almost every other conceivable type of spring—are manufactured by Herbert Terry and Sons, Ltd., of Redditch.

Packing and jointing are not without their importance in engine construction, and James Walker and Co., Ltd., of Woking, make "Lion" pump packings, as used in Rolls-Royce engines, "Golden Walkerte" jointing, and "Petso" packing for high-speed petrol pump spindles.

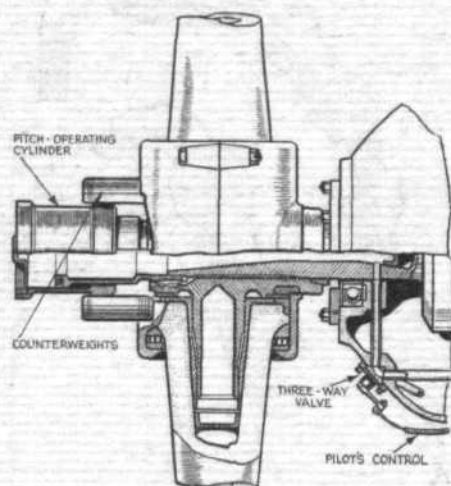
Airscrews

WHILE a number of aircraft manufacturers make their own airscrews, there are several very well-known proprietary productions on the market. The Airscrew Co., Ltd., of Weybridge, Surrey, specialise in wooden airscrews, to which they are now applying the remarkable Schwarz patent finish, by means of which the airscrew is hermetically sealed in a hard celluloid covering providing perfect protection against moisture and climatic changes, erosion by rain and hail, and damage by sand or stones.

A contrasting type of airscrew is the metal pattern, much favoured for high-speed aircraft, and, as is well known, the Fairey Aviation Co., of Hayes, Middlesex, fulfil all requirements with their products in this field. An outstanding advantage of the metal airscrew is the fact that the blades can be straightened if accidentally bent—even a makeshift repair of this kind is possible in an emergency.

Controllable-pitch airscrews are manufactured in this country under the American Hamilton patents by the De Havilland Aircraft Co., Ltd. Operating on the hydraulic system, this

airscrew is of comparatively simple and extremely sturdy construction; engine oil pressure is used to move the blades into the low-pitch position for take-off



A section through the operating mechanism of the Hamilton controllable-pitch airscrew, now being manufactured in this country by the De Havilland Company.

and climb. When the oil pressure is released the blades are shifted to the high-pitch position by means of centrifugal counterweights. Adjustment of the blade angles to any two desired pitches within any arc of from 6 deg. to 10 deg. is possible, depending upon the design.

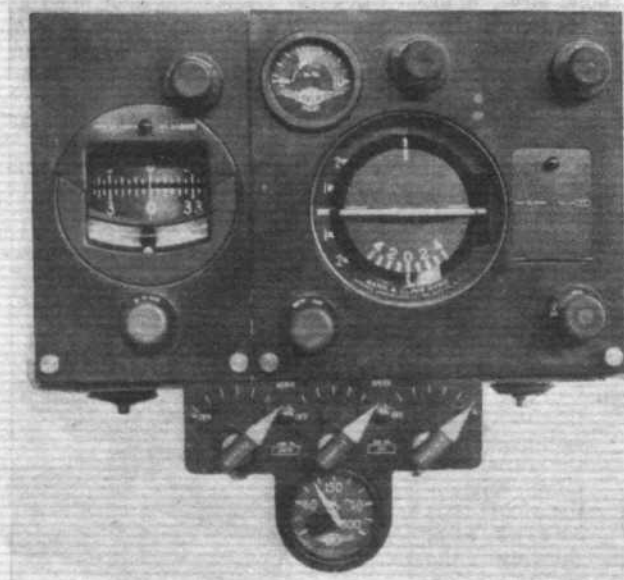
Radio Equipment

THERE is, of course, no doubt that reliable wireless transmitting and receiving equipment has done more than anything to make commercial air line

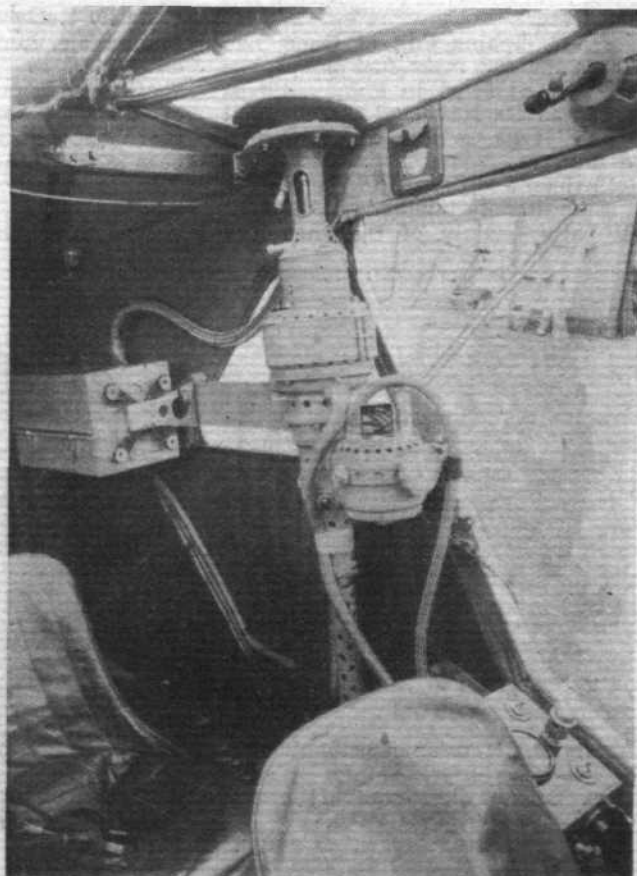
operation possible. Without its assistance air line machines would be able to fly on a bare 75 per cent. of the days in the year.

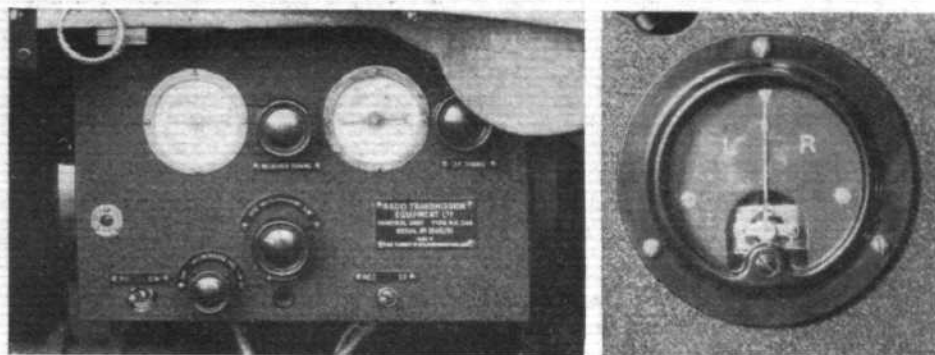
Probably the best-known manufacturers of such equipment are Marconi's Wireless Telegraph Co., Ltd., of Electra House, W.C.2, Standard Telephones and Cables Co., Aldwych, W.C.2, the Plessey Co., whose sales are handled by Radio Transmission Equipment, Ltd. (Charing Cross Road, London), and Gambrells, Rowse and Snoden, Ltd. (St. James's Square, S.W.1). The congestion on the available wave bands has meant that only a limited number of pilots can obtain direction-finding bearings from the ground stations, and the development of some form of "homing" device has been inevitable. In addition to normal radio sets, Radio Transmission Equipment produce both a D-F receiver for use in machines which already have transmitting equipment, and also a "homing" device which is complete in itself. This is fitted as standard on the Jubilee Monospar, and is used by several owners and operators. It was, in fact, the first "homing" set to be marketed outside America.

Apart from ground and flying radio equipment, including the Standard-Adcock direction finder and special short wave sets designed for communication to and from fighting aircraft, Standard Telephones also produce a "homing" device. The R.C.5, as it is known, can be used for "homing," for taking bearings, or for the reception of the usual signals, and the weight, with power plant, is 45lb. Power is taken from a rotary transformer driven from the lighting battery.



(Above) The Sperry automatic pilot is both light and compact. In it is incorporated the artificial horizon and directional gyro by which also the pilot instruments are set. (Right) The homing equipment which has been developed by Standard Telephones as it appears in the firm's own D.H. Puss Moth on which all tests have been made.





The Radio Transmission Equipment homing device. On the left is the set itself and on the right is the visual indicator to be used while "homing" on a station.

Modern air line operation has necessitated the development of some form of blind-landing device, and Standard Telephones now have the manufacturing rights for the German Lorenz system, which is installed at a large number of Continental airports and which will presently be seen at Heston. Radio beacons are also becoming a necessity, and the Marconi Company's latest development is an ultra-short-wave approach and landing beacon. The first of these will shortly be installed at Gatwick. Marconi's have also built eight mobile D-F stations for use in various parts of the country. The Plessey Company, too, have an experimental short-wave beacon installed at Croydon.

Transreceivers, Ltd. (444, Ewell Road, Surbiton, Surrey) manufacture an interesting short-wave (10m.) transmitting and receiving set which weighs only 15lb. complete and which is available for a number of purposes.

Instruments and Controls

THE use of radio has made it possible for pilots to fly safely in conditions in which blind-flying instruments are essential, and in these the pilot must put his implicit trust.

A great many instruments are made for this purpose, including the ordinary turn and bank indicators supplied by Reid and Sigrist, Ltd., of New Malden, Surrey—who also produce the now well-known Gyorizon, which in many ways combines the different functions of both a turn indicator and an artificial horizon; Smith's Aircraft Instruments (Cricklewood, London), Short and Mason (Walthamstow, London), who market the Brown turn indicator; and Cooke, Troughton and Simms, of York, who manufacture the Schilovsky; and the Williamson Manufacturing Co., of Willesden Green, N.W.10, who make the Pullin.

The Sperry Gyroscope Co., Ltd. Brentford, London, produce an artificial horizon and directional gyro which is in almost universal use on air line machines throughout the world, and are also responsible for a three-axes automatic pilot, which, too, is well tried. Automatic pilots are also manufactured by Smith's Aircraft Instruments, who have developed the original Farnborough "George," which is operated throughout by compressed air, and by P.B. Deviators, Ltd., of Croydon, Surrey, in whose instrument K.L.M. are interested. Normal instruments, such as temperature, fuel pressure and boost

gauges and the like are also made by Short and Mason and by Kelvin, Bottomley and Baird.

The operation of controls is tending to become a business for specialists, and various forms of self-contained controls such as the Arens flexible closed cable (Arens Controls, Ltd., Praed Street, London), which is now, incidentally, used for the operation of the D.H.-Hamilton C.P. airscrew; the Bowdenex conduit produced by Bowden (Engineers), Ltd., of Willesden Junction, London; and the Simmonds-Corsey control. Simmonds Aerocessories, Ltd. (Shell-Mex House, Strand, London), also produce the Simmonds-Goudime course and drift calculator.



Combining many of the virtues both of the turn indicator and the artificial horizon, the Reid and Sigrist Gyorizon is now fitted to a number of machines.

Hydraulic remote controls are manufactured by The Automotive Products Co., of Langham Street, W.1, and are used for handling quite substantial loads. These units may be operated either by hand or by an engine-driven pump. Mechanical Remote Control, Ltd. (9, Cavendish Square, W.1), market the Teleflex push-pull controls, as well as indicators for retractable undercarriages and the like.

Notwithstanding the development of gyroscopic instruments, the compass still remains a basic necessity. Probably the best known are made by Kelvin, Bottomley and Baird (18, Cambridge Street, Glasgow), and by Smith's Instruments, a firm which is handling both Huson compasses and the Holmes Telecompass, which can be used very successfully with the automatic pilot already mentioned. This last is of the distant-reading type, the instrument itself being placed in a position where it is virtually unaffected by metal masses and vibration, while simple recording and setting

instruments are placed on the pilot's dashboard. Smith's are also responsible for electrical fuel indicators.

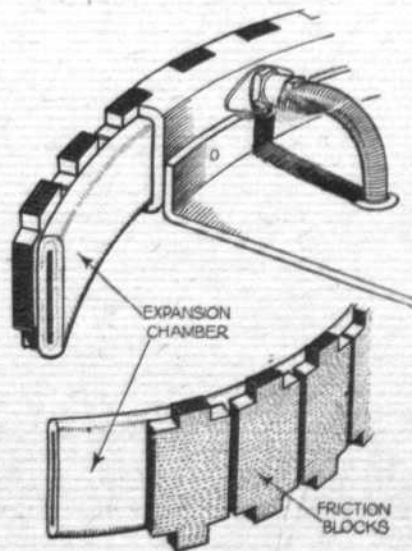
Wheels, Brakes and Undercarriages

ALTHOUGH the wheels, brakes and undercarriages of aeroplanes are only in active use for a comparatively small period, these components must, nevertheless, be capable of dealing with considerable stresses. Modern aircraft require a very comprehensive range of tyre and wheel equipment which must be as light as possible, consistent with safety.

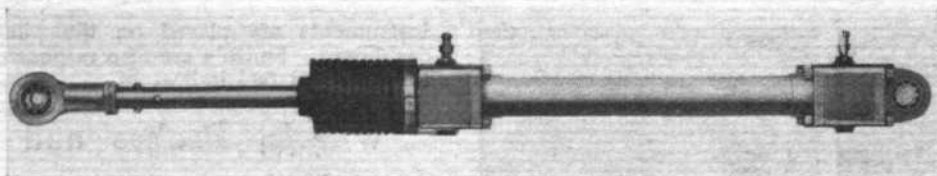
The name of the Dunlop Rubber Co., St. James's Street, London, is one that has been associated with wheels and tyres for many years, and their aircraft tyres alone are made in some forty different sizes in high and low pressure types. In addition, this firm produces a number of hub-mounted types as well as electrical conducting tail wheel covers. The Dunlop system of disc wheel construction is now sufficiently well known to require no comment and two types of brake, operated hydraulically and pneumatically, are manufactured by them. In its effort to reduce wheel weights, the Palmer Tyre, Ltd., Millbank, London, has produced a type of wheel which has been named the "Monodisk," which is a one-piece disc wheel without rivets, nuts, bolts, spokes or shields. For high-speed machines a fully streamlined "Monodisk" wheel and tyre is manufactured and the company also produces tail wheels with "Ductor" electrically conducted tyres. Another interesting product is the wheel and brake equipment for amphibians which is made in stainless steel.

Braking Systems

The Palmer wheel brake, which can be operated hydraulically or pneumatically, is well known and comprises only two parts. The name of Bendix, Ltd. Tyseley, Birmingham, is, of course, well known and their aircraft brakes combine mechanical operation with the use of servo shoes and a differential control action. One of the more interesting features of the Bendix system is the



Sectioned views of the Palmer brake drum showing the rubber expansion chamber and the friction blocks.



Weighing only 2lb., the Lockheed flap-operating jack, which has a capacity of 1000lb., is a typical example of Automotive Products' equipment.

pull-out type of parking control; this supersedes the rack and lever type which usually occupies a good deal of valuable space in the cockpit. The pull-out lever can, of course, in the same way, be left in different positions for different circumstances.

A number of important aircraft components, including hydraulic and

Chester, and the Demolition and Construction Co. (74, Victoria Street, London, S.W.1), are workers in this field, while Edward Webb and Sons, Ltd., of Wordsley, Stourbridge, deal with the seeding of aerodromes. Special implements are produced by Ransomes, Sims and Jefferies, of Ipswich, and Dennis Bros., of Guildford, while runway binding material is produced by Colas Products.

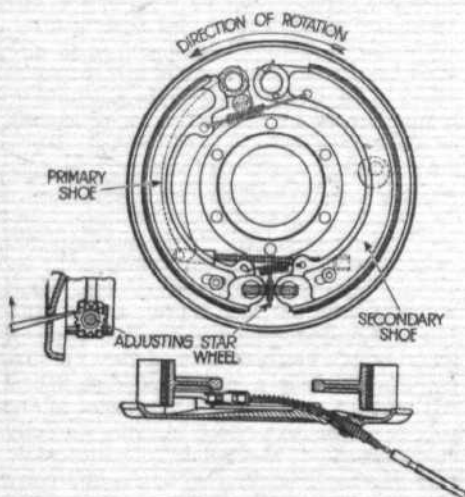
Buildings

Buildings and the like can be erected by Boulton and Paul, Ltd., Norwich, by the Fairby Construction Co., Ltd., (Africa House, Kingsway, London, W.C.2), and by A. and A. J. Law, Ltd. (132, Kingston Road, Merton, S.W.19). Special constructional methods have been developed by Horseley Bridge and Thomas Piggott, Ltd., of Tipton, Staffs, and the Hoenig Building System (Victoria Street, London, S.W.1), while such things as hangar doors are manufactured by A. L. Gibson and Co., Ltd., of Twickenham, Middlesex. Cellactite and British Uralite, Ltd. (296-302, High Holborn, W.C.1) supply roofing and ventilators for aerodrome buildings. Cellactite is actually metal sheeting protected by asbestos; this cannot corrode, and it is used for hangar doors as well as for roofs. The design of the Medway ventilator ensures the steady air change which is so necessary in all buildings where work is being carried out. The Square Grip Reinforcement Co., Ltd., of Teddington, Middlesex, specialise in concrete floors and aprons, while Nissen Buildings, Ltd. (Rye House, Hoddesdon, Herts) make light buildings which are capable of easy expansion in case of need.

Chance Bros. and Co., Ltd., of Smethwick, Birmingham. Clarke Chapman and Co., Ltd., of Gateshead-on-Tyne, and the General Electric Co., of Kingsway, London, W.C.2, specialise in the manufacture of fixed and mobile landing floodlights, illuminated wind indicators, beacons and boundary lights, while the Tilley Lamp Co., of Hendon, concentrate on paraffin vapour lamps in portable forms for various purposes. Chance

Bros. have recently designed a new type of boundary light in which the bulb which illuminates the amber globe is also used to light the supporting cone, so giving the approaching pilot an indication of his height and distance. The Aldis daylight signalling lamp (Aldis Bros., Sparkhill, Birmingham) has many uses, and is to be found in action at all airports where traffic control is necessary.

In connection with fire fighting equipment the name of the Pyrene Co., Ltd.,



These details of the Bendix brake drum show the method of adjustment.

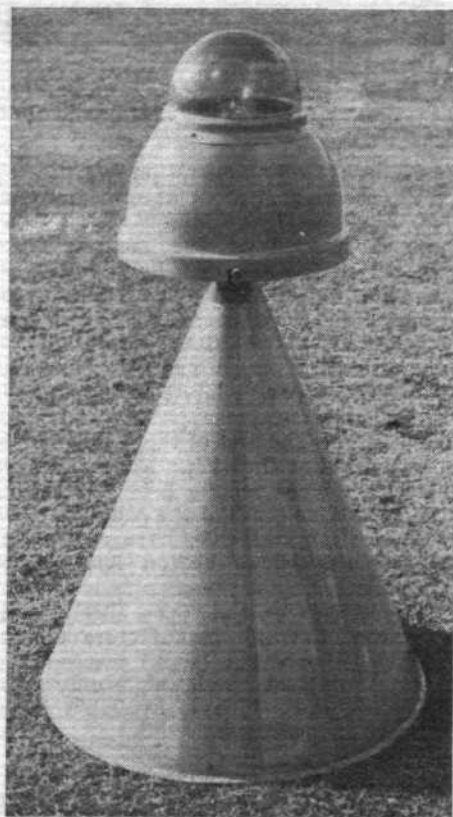
pneumatic brakes for aircraft, are made at the Vickers' Weybridge Works.

Aircraft Components, Ltd., of Cheltenham, specialise in complete undercarriages, tail wheels and flap-operating equipment. Many Service machines make use of the Dowty self-centering tail wheel shock absorbers, and the Gloster Gladiator, incidentally, employs a cantilever undercarriage with Dowty internally sprung wheels. Complete retractable undercarriages, including motors, are being supplied for many new types. A more recent entrant in the landing leg field is Turner's Motor Manufacturing Co., of Wolverhampton. This company produces a compressed air landing leg which is claimed to be the lightest possible unit. Effective rebound damping is provided for by a throttle.

Compression rubbers and other rubber shock-absorber parts are made by Burley, Ltd., 192, Tottenham Court Road, London.

Aerodrome Equipment and Lighting

SINCE municipalities and private individuals are interesting themselves more and more in aerodrome development, firms which specialise in aerodrome layout, hangar construction and aerodrome lighting are likely to become even busier. Before buildings are put up a site must, of course, be levelled and grassed. En-tout-Cas (Syston), Ltd., of Leicester, James Hunter, Ltd., of

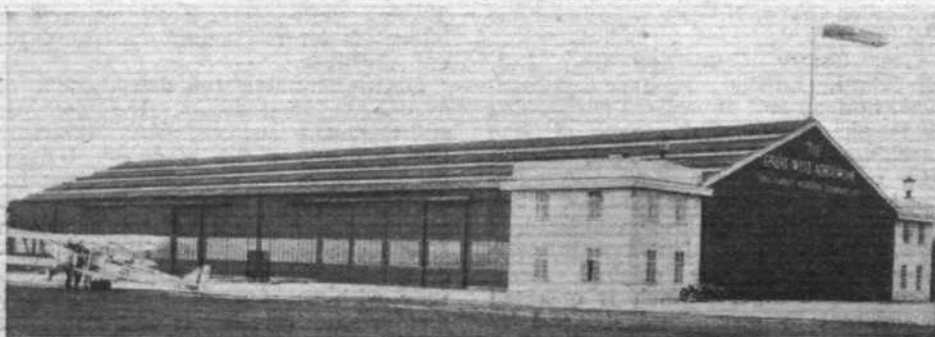


The latest type of boundary light produced by Chance Brothers.

of Brentford, Middlesex, is, of course, well known, and both service and civil aerodromes everywhere have complete equipment made by The General Fire Appliance Co., Ltd. (11, Victoria Street, E.C.4).

Fuel and Oil

THE days when mechanics carried petrol and oil cans to a waiting machine are now over and pilots expect either liquid to be pumped into their machines in the quickest and cleanest

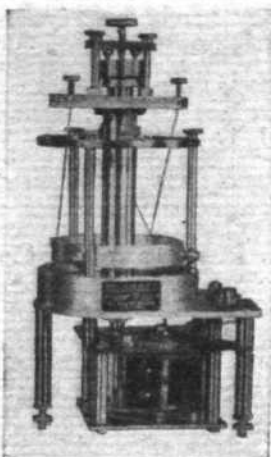


Cellactite roofing is used for this big hangar which has been built for the Fairey Aviation Company.

manner. Although the present tendency is towards the mobile refuelling unit, underground tanks with fixed pumps will always be found. One of the more interesting mobile tankers is that now being produced by Thompson Bros (Bilston), Ltd., which is virtually a tank mounted on three wheels and driven by an 8 or 10 h.p. engine. An air compressor is used for pumping either petrol or oil.

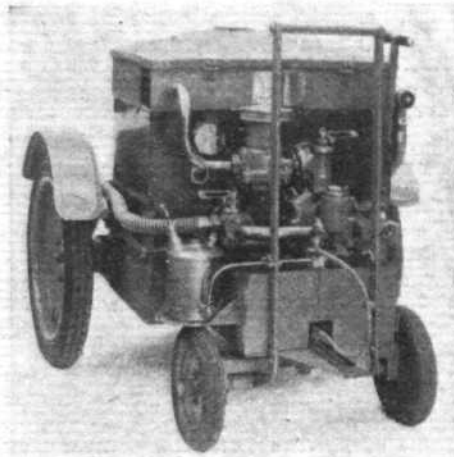
Zwicky, Ltd., of Slough, have been responsible for a considerable number of the pumping installations at Service aerodromes and this firm specialises in light-weight pumps, refuelling units which can be either hand or power operated, oil-heating units and close-filtering discharge nozzles.

In the matter of fuel and oil the needs of aero engines vary considerably. Firms such as Shell-Mex and B.P., Ltd., Strand, W.C., the Anglo-American Oil Co., and the National Benzole Co., Wellington House, S.W.1, understand these needs and their supplies are to be found at almost every aerodrome. The



(Left) The Germ Lubricants' "Comparator" for measuring "oiliness" (apart from viscosity) at high temperatures.

(Right) Where machines must be ready for action almost at once, oil heaters are essential. This is the Zwicky unit.



Dope, Paint and Preparations

THE finish of aeroplanes, whether designed for commercial or private use, is of considerable importance nowadays. Firms such as Cellon, Ltd., of

water tanks. Mouldrite, Ltd., of Millbank, London, produce thermo-plastics, including a new transparent form which is only one-third of the weight of glass.

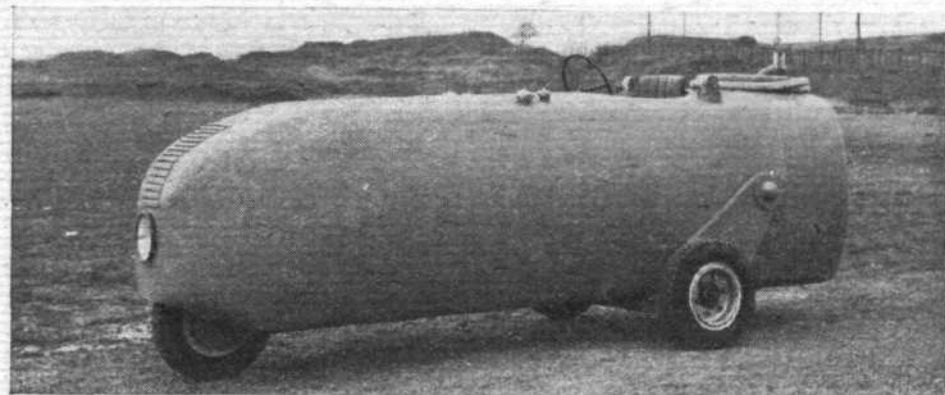
The old-established "Hermeticoll" engine jointing is made by Patent Motor Products, Ltd., 6, Upper Marylebone Street, London, W.1.

The Boston Blacking Co., of Leicester, are responsible for various types of adhesives and sealing compounds, as well as a white cement for use with polished metal and similar surfaces; these products are all covered by the name "Bostik." Among those supplying spray guns for the application of paint is the Aerograph Co., Lower Sydenham, London, who distribute the De Vilbiss.

Metals, Castings and Presswork

AN extremely large number of firms are engaged in providing metal in both finished and unfinished forms for the British aircraft industry.

Very well known among the suppliers of steel tubing, Accles and Pollock, Ltd., of Oldbury, Birmingham, make an almost endless variety of sec-

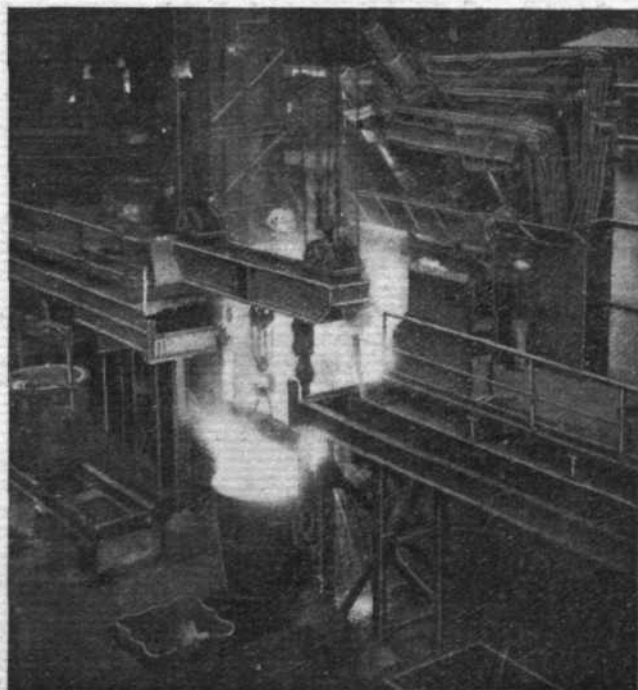


One of the most compact and efficient mobile fuel and oil units is that manufactured by Thompson Brothers.

Shell Company, in particular, have done a very great deal to make air travel possible in distant parts of the world. Among the firms which supply the necessary grades of lubricating oil may be mentioned C. C. Wakefield and Co., Ltd., Cheapside, E.C.2; Silvertown Lubricants, Minoco Wharf, London, E.16, who are responsible for Speedolene Aero Oil; Germ Lubricants, Salisbury House, Finsbury Circus, E.C.2; the Ragosine Oil Co., Ltd., of Blenheim Terrace, Leeds; Alexander Duckham, Cannon Street, E.C.4; Sternol, Ltd., Finsbury Square, E.C.2; and the Vacuum Oil Co., Caxton House, S.W.1. The Stream-Line Filter Co., Ltd., Hele-Shaw Works, Ingate Place, London, produce various types of filters for reconditioning used oil and those used for aero engine work are of the self-contained vacuum-operated type. Lightweight fuel pumps, oil filters, and, of course, grease gun equipment, are manufactured by Tecalemit, Ltd., of Brentford, Middlesex.

The Vacuum Oil Company, incidentally, have introduced an entirely new range of oils for the lubrication of aircraft engines. Instead of the usual grade letters the three oils in the new range have distinguishing marks in the form of blue, green and red bands which appear on all packages. The new oils are manufactured by the new Clearosol process by which the removal of the tar, gum and sludge-forming compounds makes the new oils especially low in carbon formation.

Kingston-on-Thames; John Hall and Sons, of Bristol; Nobel Chemical Finishes, Buckingham Gate, London; Titanine-Emaillite, Ltd., of Colindale, London; and Lewis Berger and Sons (Homerton, E.9), manufacture dopes, and, of course, a range of cellulose lacquers, enamels and varnishes for use on both wood and metal. Both the Cellon and the Titanine people have developed a range of finishing schemes to suit all conditions, and Halls specialise also in materials suitable for the protection and decoration of buildings. Llewellyn Ryland, Ltd., Balsall Heath Works, Birmingham, supply varnishes and enamels which are particularly suitable for surfaces which are under water. This firm also manufactures "Ardak" for the protection of steel, and a clear lacquer for the internal protection of



More spectacular than the resulting excellent product—the thirty-ton electric arc furnace at the Sheffield steel works of Thomas Firth and John Brown, Ltd.

tions, round, streamline, square and oval. The Albion Drop Forgings Co., Ltd., Foleshill, Coventry, specialise in heavier precision work, including, however, connecting-rod and similar forgings in light alloys. Sheet steel to Air Ministry specification for tanks, exhaust manifolds, etc., is the speciality of the Midland foundry of Baldwins, Ltd., at Stourport-on-Severn.

Aluminium in all forms is the product by which the British Aluminium Co., Ltd., Adelaide House, King William Street, London, E.C.4, has made itself famous.

Castings in aluminium and Elektron alloys are produced in a wide variety by the Birmingham Aluminium Casting Co., Ltd., of Smethwick; among them may be mentioned, by way of example, crank cases, brake shoes, carburettor bodies, and tail-skid fittings. Even such a large and complicated casting as that of the cylinder block for the Napier Culverin compression-ignition engine has presented no difficulty to these specialists. Sheet-metal pressings of many different kinds are made by T. F. and J. H. Braime, Ltd., of Hunslet, Leeds, 10, and among their finished productions are shop pans, oilcans, and similar equipment. English Steel Corporation, Ltd., Vickers Works, Sheffield, manufacture drop forgings for the leading aircraft manufacturers, and also supply a wide variety of carbon and high-tensile alloy steels. Thos. Firth and John Brown, Ltd., produce a wide range of engine and aircraft steels, including forged cylinder barrels, nickel steel bars, "Nitalloy" steel, and the recently developed N.M.C. steel, which has a high coefficient of expansion, of the same order as that of aluminium alloys.

More Light Alloys

All forms of non-ferrous castings and machined parts are manufactured by T. M. Birkett and Sons, of Hanley, Staffs, whose works are equipped with diamond boring machines and are approved by the A.I.D.

James Booth and Co. (1935), Ltd., Birmingham, 7, are famed for their Duralumin, D.2 alloy, Elektron and M.G.7 alloy, manufactured in all wrought forms. W. H. Dorman and Co., Ltd., of Stafford, manufacture a large variety of aluminium silicon alloy die castings to specification L.33.

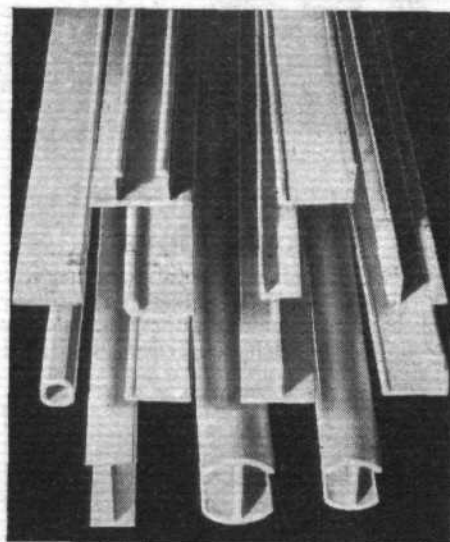
Alloy castings are the speciality of the old-established firm of William Mills, Ltd., Grove Street, Birmingham.

Stainless steels are of great importance, especially in the construction of marine aircraft, and in this direction the products of Firth-Vickers Stainless Steels, Ltd., of Sheffield, play a very large part, being used extensively in practically all the leading types of military aircraft, both seaplanes and land-

planes. The one-time problem of "weld-decay" with stainless steels has now been overcome.

Strip steel, which has many applications in aircraft construction, is the speciality of J. J. Habershon and Sons, Ltd., Holmes Mills, Rotherham.

High-Duty Alloys, Ltd., of Slough, are manufacturers of the well-known Hiduminium R.R. series of high-tensile aluminium alloys which are produced in



Some special sections by the Reynolds Tube Co., Ltd.

all cast and wrought forms. Sand and die castings and drop stampings are produced in an exceedingly wide variety, both for engine and airframe components. An associated company, Magnesium Castings and Products, Ltd., are manufacturers of the Magnesium series of Magnesium-base alloys. Bearing metal is the special product of the Hoyt Metal Co. of Great Britain, Ltd., of Putney, London, S.W.15, and the example which is of greatest interest to the aircraft engine manufacturer is their No. 11 metal, now extensively used at home and abroad. Kayser, Ellison and Co., Ltd., of Sheffield, manufacture all types of special steels used in engine and airframe construction, but they are, perhaps, best known for their K.E.965 heat-resisting valve steel.

Bearing metals in wide variety are produced by the Glacier Metal Co., Ltd., of Ealing Road, Wembley, London. Heritier, Ltd., of Erdington, Birmingham, cast crank cases, pistons, heads and other parts in aluminium.

F. A. Hughes and Co., Ltd., of Abbey House, Baker Street, London, W.1, are owners of the British Elektron alloy patents and supply this famous alloy in ingot form.

A small but important contribution to the metallurgy of aircraft manufacture is the silver solder supplied by such

firms as Johnson Matthey and Co., Ltd., of 73-82, Hatton Garden, London, E.C.1.

Castings ranging from crank cases weighing 150 lb. down to small die-cast cable clips weighing a fraction of an ounce are produced by Lightalloys, Ltd., of St. Leonards Road, London, N.W.10; this firm is the pioneer of "Alpax" metal. The London Aluminium Co., Ltd., of Witton, Birmingham, specialise in sheet work in aluminium and other light alloys, and also in small alloy presswork.

"Oilite" self-lubricating bronze bearings, anti-friction white metal alloys, and "Damaxine" phosphor bronzes are the products of The Manganese Bronze and Brass Co., Ltd., of Ipswich. James H. Randall and Son, of Green Street Works, Paddington, London, W.2, are sheet-metal workers, and their products for the aircraft industry include such items as fuel tanks.

The Northern Aluminium Company are well known as suppliers of aluminium and aluminium alloy sheet, and in particular of "Alclad" sheet, in which the high strength aluminium alloy core of NA.17ST or NA.24ST is coated on each side with high-purity aluminium. They also supply extruded sections in a wide range of alloys.

"Luster" rolled copper, brass, phosphor bronze and other metals are the speciality of J. F. Ratcliff (Metals), Ltd., of New Summer Street, Birmingham.

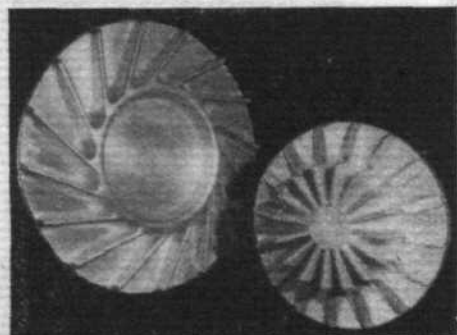
Jas. C. Nicklin, Ltd., Cross Street, Smethwick, stock a wide variety of steel and alloy to Air Ministry specifications.

Varieties of Steel

Rubery, Owen and Co., Ltd., of Darlaston, Staffs, specialise in machining stainless and other high-tensile and alloy steels, and also supply bright-drawn steel. Seamless steel tubing, taper gauge tubes, and tubular manipulation of all kinds are the specialities of the Reynolds Tube Co., Ltd., of Tyseley, Birmingham, who also have an aluminium alloy department producing seamless tubing, rods and bars for machining, and standard and special extruded sections. Sterling Metals, Ltd., of Coventry, were pioneers in the development of Elektron castings, and the interest of engine builders is likely to be stimulated by the recent development of a process of heat treatment which greatly improves the mechanical properties of Elektron castings. George Taylor (Brass Founders), Ltd., of Bolton, supply castings of finished work in bronze, brass, nickel, aluminium, and other materials.

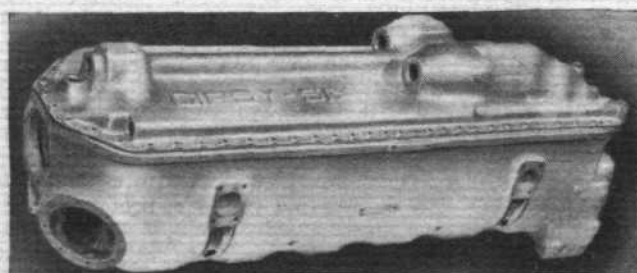
"Sandvik" aircraft steels are the speciality of the Sandvik British Agency, Ltd., Norwich Union Chambers, Congreve Street, Birmingham, 3.

The "Ceralumin" series of aluminium alloys (J. Stone and Co., Ltd., Deptford, London, S.E.14), to D.T.D. specifications 250, 255 and 287, now include "Ceralumin F." which is particularly



(Left) Impeller stampings in R.R.56 alloy by Magnesium Castings and Products, Ltd.

(Right) Crank case and top cover of Gipsy Six engine in Elektron by Sterling Metals, Ltd.



suitable for such parts as connecting rods, pistons, crank cases and cylinder heads. They also prepare a range of Elektron alloys, including heat-treated Elektron.

The United Steel Companies, Ltd., of Sheffield, produce the famous "Diamet" steels, manufactured by their high frequency electric melting process which, it is stated, ensures steels that are "clean," i.e., free from non-metallic contamination.

Yorkshire Engineering Supplies, Ltd., of Wortley, Leeds, specialise in phosphor bronze and gunmetal, cast by their Eatonia water-cooled process.

Works extensions are being made by E. G. Browne and Co., of West Road, London, N.17, to cope with orders for their aircraft sheet-metal work.

Wood

THE supply of wood for use in aircraft construction is a specialised business, but constructors are well catered for. For example, there is the Aeronautical and Panel Plywood Co., Ltd., of 218-226, Kingsland Road, London, E.2. Pioneers in this business, they make the well-known "Mallite" and "Apco" plywood. They have recently installed new machinery, and are now able to make every kind of plywood in flat and curved sheets, mouldings, etc.

Plywood is also marketed by Laminated Wood Products, Ltd., of 109, Kingsway, London, W.C.2, who handle the well-known Saro plywood made by Saunders-Roe, Ltd., and used extensively in aircraft construction; it was employed in the first four machines in the King's Cup Race. Another manufacturer of plywood is the firm of Flexplywood Industries, Ltd., of South Chingford, London, E.4, who specialise in plywood to specification 4 V3 for such parts as spar flanges. They make, too, plywood for covering, and also cabin panelling. A wide variety of aircraft wood is handled by Louis Bamberger and Sons, 27-28, Finsbury Square, London, E.C.2.

Cabin Fittings, Works Equipment, Miscellaneous Accessories

THERE are, of course, a large number of accessories which cannot conveniently be classified under the foregoing headings in this accessory review. For instance, there is the matter of cabin equipment, which, with the steady growth of air travel, is gaining increasing importance. In this connection everybody is familiar with the name of L. A. Rumbold and Co., Ltd., of Kingsgate Place, London, N.W.6. They have been responsible for the furnishing of

the cabin interiors of practically all the civil aircraft in this country, and are specialists in the manufacture of lightweight metal furniture and in the carrying out of decoration schemes. They have also brought the subject of cabin sound-proofing to a fine art.

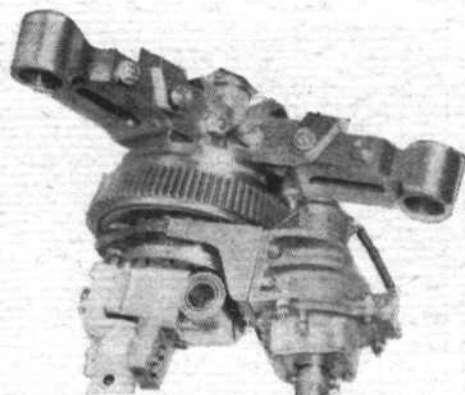
Several other firms concentrate on window fittings; there is, for example, the Young constant-balance window (William Young, M.I.A.E., Claydon Works, Wishaw, Scotland), which "stays put" when slid to any required position. Weathershields, Ltd., Moor Street, Birmingham, 4, make an extremely practical sliding roof for aircraft. Worcester Windshields, Ltd., of Worcester, concentrate on glass panel equipment covering screens, sliding windows and the like. Triplex glass for windscreens and windows and also for covering instrument panels, is supplied by the Triplex Safety Glass Co., Ltd., 1, Albemarle Street, London, W.1, who, of course, also make the almost universal Triplex goggles. As everybody knows, "Float-on-Air" upholstery is the speciality of David Moseley and Sons, Ltd., of Ardwick, Manchester, and their seat cushions have been used on many record-breaking flights. They also make



An aeroplane seat with Moseley "Float-on-Air" upholstery.

various types of petrol-resisting hose and other aircraft accessories. Rubber accessories are, needless to say, produced in a wide variety by the Dunlop concern (Aviation Department, Fort Dunlop, Birmingham), and "Dunlopillo" cushioning material is rapidly gaining popularity for use in aircraft.

Although the products of Bakelite, Ltd. (68, Victoria Street, S.W.1), are used for electrical insulation and the like it is in connection with cabin equipment and mouldings that the word Bakelite is generally known. Few people outside the trade realise that this company also produces Bakelite varnish



This is the original C.30 Autogiro rotor head, which was made by the Mollart Engineering Co., who manufacture the ball joints used in this unit.

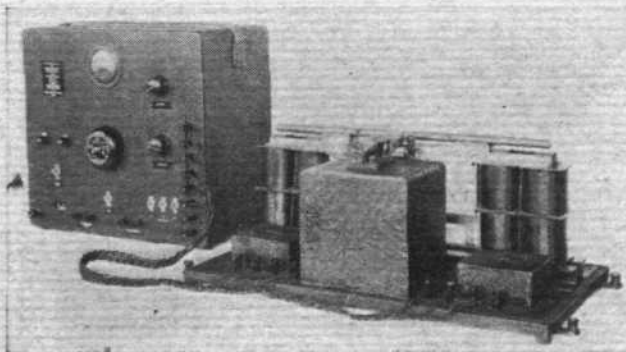
and lacquers as protective coatings for metal parts.

Long-distance aeroplanes, like long-distance trains, involve special arrangements for passengers' comfort, and in this connection James Beresford and Son, Ltd., Cato Street Works, Birmingham, 7, fulfil requirements with a range of lightweight folding wash basins and some simple, light, but highly efficient sanitary equipment. The latter has recently been considerably improved and the weight greatly reduced.

In the sphere of factory equipment we have the specialities of Desoutter Bros., Ltd., The Hyde, London, N.W.9. They make a wide range of tools, of which their electric drills are of particular interest to the aircraft industry; there are high- and low-speed drill guns, a corner drill and a screw gun. Grinding machinery is made by K. Johnson and Sons, Erskine Works, Leicester, and three of their productions in particular are favoured by aircraft manufacturers: a heavy type disc grinder, a wet type drill and tool grinder, and a new type of grinder for carbide-tipped tools. Stocks, taps, dies and screwing equipment are the specialities of Thomas Chatwin and Co., of Great Tindal Street, Birmingham, 16, while J. B. Stone and Co., Ltd., 135, Finsbury Pavement, London, E.C.2, make nibbling machines and other sheet-metal-working equipment. Machine-tool cutting lubricants are the speciality of Fletcher Miller, Ltd., of Dukinfield, Cheshire.

Vickers (Aviation) Ltd., Weybridge, make the Vickers bent-beam lifting gear for engines, used in conjunction with a trolley.

Oxy-acetylene welding equipment is a speciality of the British Oxygen Co.,



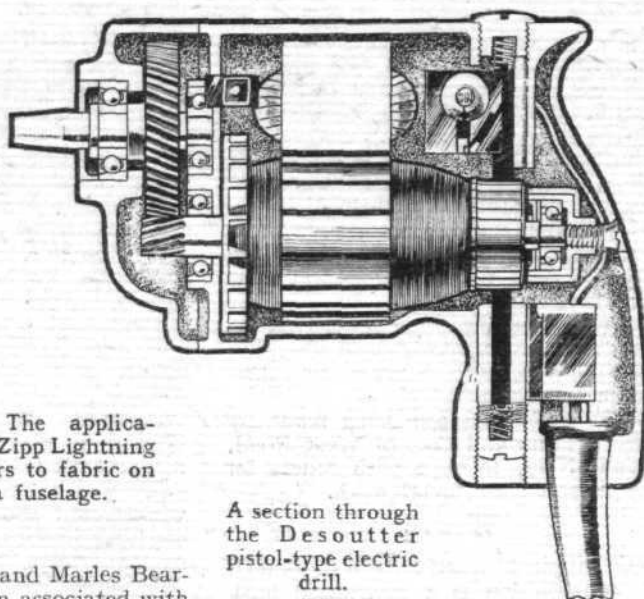
(Left) The electromagnetic fatigue testing apparatus developed by the Salford Electrical Instrument Co

(Right) Modern passengers demand modern comfort. This is luxury seating by Rumbolds.





(Left) The application of Zipp lightning fasteners to fabric on a fuselage.



A section through the Desoutter pistol-type electric drill.

Ltd., Victoria Station House, London, S.W.1.

The "Frama" oxy-acetylene welding process, evolved by C. H. Johnson and Sons, Ltd., Smedley Road, Manchester, 8, has proved particularly suitable for work on Staybrite, Stellite, Birmabright and pure aluminium.

Heat-treatment furnaces designed for aircraft work are a speciality of the Incandescent Heat Co., Ltd., Cornwall Road, Smethwick.

Electrical testing equipment of many different varieties is made by Salford Electrical Instruments, Ltd., of Silk Street, Salford, 3; a very interesting production is their electro-magnetic fatigue tester.

Turning now to something entirely different we have the various aircraft cameras made by the Williamson Manufacturing Co., Ltd., of Litchfield Gardens, London, N.W.10. Their aircraft cameras are in use all over the world for surveying and other work, and their camera guns play a vital part in Air Force training.

Ice-fighting

Again by contrast there is the Dunlop Anticer. Of the chemical type, as opposed to the mechanical, it was described in detail in articles on ice formation in *Flight* of July 4 and November 14. It is handled by the aviation department of the Dunlop Rubber Co., Ltd.

Flotation gear, including the Youngman dinghy, is the equipment for which the R.F.D. company, of Stoke Road, Guildford, is usually famed, but they also make scores of other things, mainly in the wire-and-fabric line, ranging from kite balloons to wind-socks.

A practical accessory which must not be overlooked is the Frazer-Nash Safety Enclosed wing-tip flare, handled by Smith's Aircraft Instruments. Another excellent wing-tip flare is the Holt, of war-time fame, now handled by Y.S.C., Ltd., 13, Thavies Inn, London, E.C.1.

Next we turn to the firms making smaller component parts for airframes and/or engines. For example, there is a new range of aircraft ball bearings made by the Hoffmann Mfg. Co., of Chelmsford, one variety being specially designed for use in exposed positions, e.g., for control pulleys. Silentbloc, Ltd., Victoria Gardens, London, W.11, make the well-known Silentbloc bearings, now being used for controls, landing gear, etc., and "Floatex" mountings for engines, radiators and instrument

boards. The Ransome and Marles Bearing Co., Ltd., have been associated with the aircraft industry since the earliest days, and in addition to their engine bearings, make bearings and pulleys for controls. An interesting type of flexible spiral roller bearing is made by Geo. Salter and Co., Ltd., of West Bromwich, who are also specialists in the manufacture of springs of all types. Another well-known spring manufacturer is the Lewis Spring Co., Ltd., of Resilient Works, Redditch, while no discussion on springs would be complete without mention of the famous Terry concern of Redditch.

Universal ball joints for aircraft are a speciality of the Mollart Engineering Co., of Thames Ditton, Surrey, who, incidentally, have developed a joint of this type as the basis for the rotor head of the Cierva Autogiro.

The well-known Zipp lightning fastener (Kynoch Works, Witton, Birmingham) has for some years been used on fabric-covered fuselages for allowing access to the interior, and recently an improved version has been produced which is not affected adversely by the doping process.

"Plastilume" is a remarkable new plastic moulding material which has many uses in aircraft. It is made by Plastilume Products, 25, Maclise Road, Kensington, W.14.

A large variety of components, such as tail attachment fittings, bomb release gear, gun mountings and various work involving gear cutting is produced by the Corona Engineering Co., of Leighton Place, London, N.W.5. Streamline wires and tie rods, control cables and various fittings are made by Bruntons, of Musselburgh, Scotland.

Brown Bros., Ltd., London, E.C.2, who are so well known in the motoring world, also carry vast stocks of aircraft manufacturing material, ranging from steels to aviation clothing, and including a wide variety of light and heavy aerodrome workshop equipment.

Portable oil cooking stoves are made by Taylor's, Auckland Hill, West Norwood, London, S.E.27.

Vickers (Aviation), Ltd., make, in addition to their major components, a number of smaller accessories (wires, pipe fittings, etc.) too numerous to detail. Tail-skid shoes in manganese steel are a speciality of Edgar Allen and Co., Ltd., of Sheffield.

The Cork Manufacturing Co., Ltd., of South Chingford, London, E.4, are the sole manufacturers of Langite jointing, which conforms to Air Ministry specification D.T.D.219; it is impervious to oil, petrol and many other liquids.

Ultra-lightweight aero wheels are a speciality of Snellings' Light Aircraft Service (404, Blackburn Road, Darwen), *Pou* and glider experts; incidentally, they are shortly to market a high-wing ultra-light monoplane at approximately £195. *Pou* parts, too, are a speciality of E. G. Perman and Co., Brownlow Mews, Gray's Inn Road, London, W.C.2.

The Redwing Aircraft Co., Ltd., of Croydon Airport, supplies finished parts for Service machines built by various firms, and this company is now increasing considerably its working equipment since orders have been received both from the Air Ministry and the Admiralty.



The big hangar at Heston, in which all kinds of aircraft repairs are carried out by Airwork, Ltd.

Overhauls and Repairs

SINCE licensed ground engineers and overhaul equipment are to be found at almost every aerodrome in the country, it would obviously be impossible to deal with every firm and club where C. of A. overhauls and the like are carried out. However, two or three well-known firms may be mentioned who have for some time specialised in such work, and the same applies to the agencies.

It would scarcely be an exaggeration to say that all the parts mentioned in the foregoing notes could be incorporated to order in aeroplanes handed over, for instance, to Airwork, Ltd., of Heston. This firm's Central Repair Station, recently completed, has a floor area of 60,000 sq. ft., and all manner of repair and C. of A. work can be carried out there. Airwork, too, is one of the few firms which have Air Ministry approval for the repair and overhaul of magnetos.

Another very well-known firm is Rollason Aircraft Services, Ltd., of Croydon Airport, who, while concentrating rather on De Havilland machines and engines, for which they are concessionaires, have also had a very wide experience of work on both British and foreign types. Their spares department is one of the most complete, and a few months ago they took over the N.F.S. workshops at Hanworth.

Wrightways, Ltd., of Croydon Airport, is also a business of long standing, though they may not be remembered by everyone under this name, since the firm is virtually a reorganised development of Wrightson and Pearse, Ltd. They also specialise in quick repairs, and their work is mainly concerned at present with engine overhaul.

At Portsmouth

Full repair and overhaul facilities are found at the Portsmouth Airport premises of Portsmouth, Southsea and Isle of Wight Aviation, Ltd. Comper and Walker, Ltd., the well-known aeronautical consultants, of 86, Strand, London, W.C.2, supervise repairs and purchases.

Air Travel, Ltd., of Penshurst, Kent, undertake all kinds of repairs and C. of A. overhauls, and sell second-hand machines, while Aviation Commerce, Ltd., of 6, Lansdowne Hill, London, S.E.27, carry out engine and airframe repairs and also hold a large stock of Avro 504N spares.

Turning to the agents, we have (in addition to Airwork, Rollasons and Wrightways, mentioned above, and Brian Lewis and Co., who have branches at Aldenham and Hooton and an office at 30, Conduit Street, London), Aircraft Distributors, Ltd., of Hanworth, who are agents for Phillips and Powis aircraft, and other leading makes, new and second-hand. Aircraft Exchange and Mart, of 7, Park Lane, W.1, are agents for the Monospar, Blackburn B2, Parnall Heck, and Aeronca, and handle other makes of new and second-hand aircraft. Brian Allen Aviation, Ltd., of Croydon, are concessionaires for the American Stinson and leading makes of British new and second-hand machines. Malcolm and Farquharson, Ltd., of Heston, sell second-hand aircraft.

Last, but not least, we have Brooklands Aviation, Ltd., who, in addition to their repair work, act as agents.



An Irvin parachute, with lap-strap harness and the pack arranged as a chair cushion in a passenger aircraft.

Parachutes and Pilots' Equipment

OF accessories for the man as opposed to those for the machine, there is again no lack of choice. To start with parachutes, there are four makes on the market. The G.Q. Parachute Co., Ltd., of Stoke Road, Guildford, Surrey, manufacture, in addition to a selection of parachute equipment of a more or less orthodox nature, the "Harnasuit" and the "Parasuit"; the former is virtually a standard service suit incorporating de-



The neat G.Q. "Parasuit."

tachable silk harness equipped with quick-connector hooks for a lap-type pack. The "Parasuit" is an ingeniously designed back-type pack very neatly incorporated in a Sidcot suit.

The Irvin parachute, made by Irving Airchute of Great Britain, Ltd., of Letchworth, Herts, is the standard equipment in the Royal Air Force, and is used all over the world. A number of types are manufactured, all similar in general principle, but differing in the matter of the position of the pack; the most popular is the Service-type seat pack.

A parachute of distinctive design is the Russell "Lobe" type, which has a canopy of a kind which the name suggests, this design resulting in unusually steady descent. The makers are the British Russell Parachute Co., Dunsmore Road, Stoke Newington, London, N.16.

The fourth make is the Pak, manufactured by the Pak Parachute Co., Ltd., of Mitcham, and they offer a range of parachutes of the seat, quick-connector and back types.

Turning now to clothing, we find an endless choice offered by a large number of firms, among whom may be mentioned D. Lewis, Ltd., of 124, Great Portland Street, London, W.1, who make and sell almost every variety of flying suit, helmet, goggles, leather coat, etc. Another firm, S. Lewis, of 27, Carburton Street, London, W.1, who supply the leading clubs, also offer a most extensive range of clothing of all types. Flying clothing, again, figures among the many types of garments handled by Moss Bros. and Co., Ltd., of Covent Garden, London, W.C.2. Service kit is a speciality of Burch's, Bedford Street, London, W.C.2; Burberrys, Ltd., Haymarket, London, S.W.1 (who are contractors by appointment to the Royal Air Force College, Cranwell); Gieves, Ltd., 21, Old Bond Street, London, W.1; and Alkit, Ltd., Cambridge Circus, London, W.C.2.

The extremely luxurious Meyrowitz goggles (E. B. Meyrowitz, Ltd., 1a, Old Bond Street, London, W.1) and the very well-known Triplex goggles (Triplex Safety Glass Co., 1, Albemarle Street, W.1) are stocked by most outfitters.

Nautical

ALTHOUGH only an "accessory after the fact," no description of general equipment would be complete without reference to seaplane tenders, the best-known makers of which are the British Power Boat Co., of Hythe, Southampton.

Power tenders of this make are to be found at seaplane and flying-boat stations throughout the world, and are used for either passenger-carrying, ambulance or refuelling work. The normal type is fitted with two 100 h.p. motors, which give a maximum of 30 m.p.h.—a speed which is reached in 10 seconds.

More interesting, perhaps, from a technical point of view is the armoured target boat which is used for bombing practice with stannic chloride bombs. The crew, motors and wireless equipment are protected by the armour plating, and the boat, in any case, is rendered unsinkable, however badly it may be damaged, by means of buoyant material.

The firm, of course, specialises in high-speed tenders for all purposes, and Mr. Hubert Scott-Paine, whose company it is, has been responsible for a number of successful racing boats.

THE ROYAL AIR FORCE

SERVICE NOTES AND NEWS



AIR MINISTRY ANNOUNCEMENTS



STEEP AND SLOW : One outstanding feature of the Hawker Service types is their docility, which goes hand in hand with extreme performance. It may be assumed that a generous measure of that same "niceness" has been instilled into the new monoplane. The flaps, it will be seen from this *Flight* photograph, are of large area, and should steepen the glide considerably. Doubtless the somewhat "stilty" retractable undercarriage is accounted for by the immense airscrew used to absorb the terrific output of the Rolls Merlin.

WAR RECORDS OF SQUADRONS

In order to foster *esprit de corps*, it has been decided to supply squadrons which took part in the war of 1914-18 with some official reminder of the part they played. In view of this decision, each squadron to whom it applies will be presented with a document (in original, if available) relating to some noteworthy achievement or item of historical or other interest concerning the work of the squadron during the war period. The intention of the Air Council is that this document, when presented, should be suitably framed and displayed in a place to be selected by the squadron commander.

In pursuance of this scheme, an examination of the documents available at the Air Historical Branch, Air Ministry, is in progress, and this has now reached the stage at which issue of selected documents to approximately twenty-five squadrons can be made. Squadrons for which records have already been selected will shortly be notified direct by the Air Ministry, and a copy of the selected document will be forwarded to each. Other squadrons will be communicated with as and when further selections are made. Commands will be notified when documents for any of their units are ready for issue.

It is pointed out that many of the documents are of considerable historical value and, in order to ensure that their preservation is safeguarded to the maximum degree possible, each document is being mounted and sealed within sheets of glass by the British Museum authorities.

On receipt of a copy of the document selected for his unit, a squadron commander is to notify the Air Ministry whether he wishes the original to be forwarded to the squadron forthwith or whether he wishes it first to be framed. In the former case, No. 1 Stores Depot will pack and despatch it under service arrangements. The squadron will then be responsible that steps are immediately taken to have it suitably framed, care being exercised that the original sealing is not disturbed. In the latter case it should be noted that two sample frames to hold one foolscap sheet each have been made at No. 1 Stores Depot. One provides for a single-sided, and the other for a double-sided, document.

HALTON AERODROME

Halton aerodrome is not to be used after 1200 hours on Wednesday and Friday except in emergency.

AIR FORCE LIST—CHANGE IN DESIGN

As from January, 1936, the Air Force List will appear in a new form. A rearrangement of the contents of the list in a more logical order and a reconstructed and expanded index of names are the main features of the new list. Opportunity is also being taken gradually to omit the first names of officers from the lists of commands and units.

To enable these changes to be effected it will be necessary to dispense with the publication of the list normally due on December 1, 1935. No further publication of the list will be made, therefore, until January, 1936.

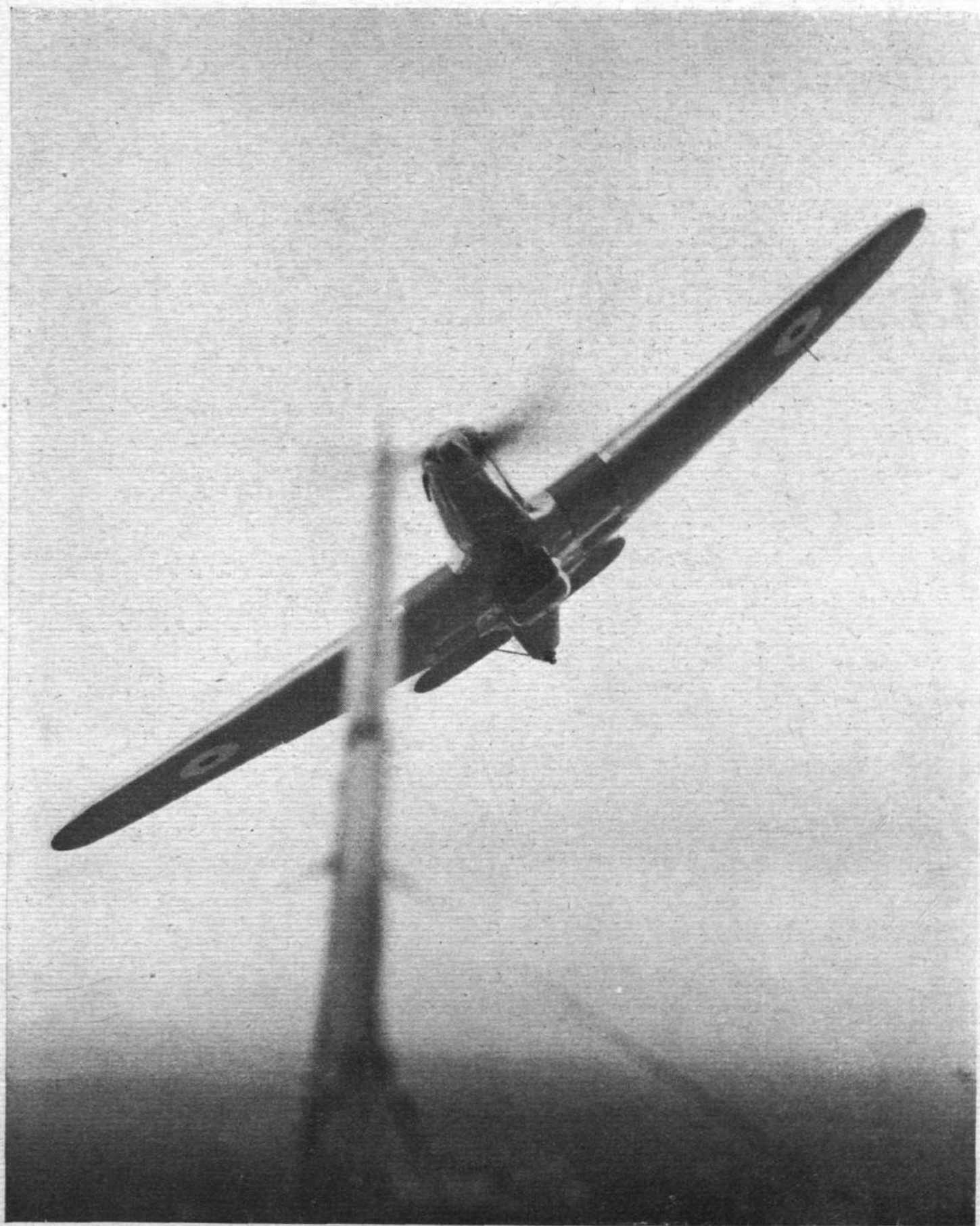
PROMOTION OF OFFICERS

In consequence of the present expansion of the Air Force, the Air Council have reviewed the position of officers of the general duties branch who have passed out of the zones of promotion appropriate to their respective ranks and have decided that a strictly limited number of promotions shall be made from among them. This departure from the policy laid down is an exceptional measure and future promotions will be made in accordance with normal procedure. The names of the officers selected for promotion under this order will appear in the *London Gazette* of November 26, 1935.

CATAPULT FLIGHTS RENUMBERED

Seaplanes operated from catapults in the Fleet Air Arm have been renumbered. Those in the 2nd Battle Squadron and Battle Cruiser Squadron, hitherto known as No. 444 Flight, become No. 400 (Catapult) Flight. Those of the 2nd Cruiser Squadron, hitherto No. 407 Flight, become No. 406 (Catapult) Flight. Those of the 1st Battle and 1st Cruiser Squadrons (Mediterranean) become Nos. 402, 404, and 405 (Catapult) Flights. Those of the 3rd Cruiser Squadron (Mediterranean) become No. 407 (Catapult) Flight; 4th Cruiser Squadron (East Indies), No. 408 (Catapult) Flight; 5th Cruiser Squadron (China), Nos. 409 and 410 (Catapult) Flights; and 8th Cruiser Squadron (America and West Indies), No. 412 (Catapult) Flight. There are at present no aircraft in the 6th Cruiser Squadron (Africa Station).

LEARNING its TRADE



This is not, as might reasonably be supposed, the first Hawker monoplane, for some ten years back there appeared the Duiker, a high-wing two-seater, built experimentally for the R.A.F. Nevertheless in the new monoplane Flt. Lt. P. W. S. Bulman has a doubtless fascinating subject for investigation and the R.A.F. the fastest fighter in the air. A single-seater, it mounts the equally new Rolls-Royce Merlin engine, so far not type-tested. The tail wheel retracts in addition to the main undercarriage, flaps are fitted, and the pilot is enclosed. (*Flight* photograph.)

DOMINION CO-OPERATION

It has already been announced in *Flight* that an exchange for two years had been effected between Air Comdre. H. R. Nicholl, C.B.E., R.A.F., and Air Comdre. S. J. Goble, C.B.E., D.S.O., D.S.C., R.A.A.F. An official statement now adds the following particulars:—

Air Comdre. H. R. Nicholl, C.B.E., who has been Air Officer Commanding, Central Area, Royal Air Force, since March, 1934, proceeded to Australia on November 19, 1935, to serve with the Royal Australian Air Force as a member of the Air Board for a period of two years.

Air Comdre. S. J. Goble, C.B.E., D.S.O., D.S.C., of the Royal Australian Air Force, who is expected to arrive in this country early in December, will be posted for duty at the Air Ministry as Deputy Director of Operations for the same period.

Air Comdre. H. R. Nicholl, C.B.E., entered the Royal Flying Corps as a 2nd Lieutenant in 1915, and his subsequent war service, for which he was awarded the French Légion d'Honneur (Chevalier) in 1916 and the O.B.E. in 1919, included the command of various squadrons both in France and England. He was appointed to a permanent commission as Squadron Leader in 1919 and, after employment on Air Staff duties at various Headquarters and at the Air Ministry, he completed a course at the Royal Naval College, Greenwich, in 1926. He commanded a squadron in Iraq from 1926 to 1929, after which he served successively as Deputy Director of Personal Services and Deputy Director of Manning, Air Ministry, before proceeding to the command of the Royal Air Force Base, Calshot, in 1932. In March, 1934, he was appointed to the command of Central Area in the Air Defence of Great Britain. Air Comdre. Nicholl received the C.B.E. in 1929. He was promoted to Wing Commander in 1922, to Group Captain in 1929, and attained his present rank in July, 1933.

Air Comdre. S. J. Goble, C.B.E., D.S.O., D.S.C., who was born in Australia, entered the Royal Naval Air Service as Probationary Flight Sub-Lieutenant in 1915 and, on completion of flying training, served in France with distinction, receiving the D.S.C. and the French Croix de Guerre in 1916, the D.S.O. in 1917, and the O.B.E.

ROYAL AIR FORCE GAZETTE

London Gazette, November 26, 1935

General Duties Branch

F. W. Thompson is granted a permanent commission as Pilot Officer with effect from October 1 and with seniority of July 9, 1934 (substituted for the notification in the *Gazette* of November 5); W. S. Gardner is granted a short service commission as Pilot Officer on probation with effect from and with seniority of November 13; Sub-Lt. G. C. Newcombe, R.N., is re-attached to the Royal Air Force as a Flying Officer with effect from November 11 and with seniority of May 19.

The following Acting Pilot Officers on probation are confirmed in rank and graded as Pilot Officers (October 19):—A. G. G. Baird, R. D. Blair, A. C. Brown, F. S. D. Burgis, A. A. Case, A. J. F. Churchill, R. N. Cook, M. P. C. Corkery, R. I. K. Edwards, R. M. Elms, C. F. Herington, T. S. Jameson, M. M. Kane, C. F. King, H. R. Larkin, J. R. Maling, F. L. Newall, S. R. R. Smith, P. Stevens, H. T. Sutton, K. M. M. Wasse, D. C. Yorke.

The following Acting Pilot Officers on probation are graded as Pilot Officers on probation:—B. G. Carroll, K. N. M. Eyres, J. Mercer, T. G. Tideman (September 14); G. W. P. Derbyshire, R. H. S. King, A. J. Young (October 14); A. E. Saunders (October 19); R. Cave-Brown-Cave (November 4).

The following promotions are made with effect from November 26 in accordance with the provisions of Air Ministry Order A.285/1935:—

GROUP CAPTAIN TO BE AIR COMMODORE.—J. H. S. Tyssen, M.C.
WING COMMANDERS TO BE GROUP CAPTAINS.—J. H. Herring, D.S.O., M.C.; A. Shekleton, D.S.O., O.B.E.; C. H. Nicholas, D.F.C., A.F.C.
SQUADRON LEADERS TO BE WING COMMANDERS.—C. B. Cooke, C. E. H. James, M.C.; J. Noakes, A.F.C., M.M.; F. J. Vincent, D.F.C., A. Durston, A.F.C.

F/O. R. N. Clarke is promoted to the rank of Flight Lieutenant (October 13); P/O. C. H. D. Wardrop is promoted to the rank of Flying Officer (October 6); Wing. Cdr. G. R. A. Deacon, M.C., is placed on the retired list at his own request (November 16). The short service commission of Acting Pilot Officer on probation E. P. Chapman is terminated on cessation of duty (November 14). Lt.

in 1919. He resigned his commission in the Royal Air Force in 1921 on appointment to the Royal Australian Air Force. He received the C.B.E. in 1924. He has been the Air Member for Personnel, Royal Australian Air Force, since 1921, with the exception of periods spent in this country attending courses at the Imperial Defence College and the Royal Air Force Staff College.

REVISED MEDICAL STANDARDS FOR AIRMEN

Owing to the increased requirements in personnel of the expanded Royal Air Force, it has been decided that airmen in all groups who, under existing standards, would be liable to discharge as physically unfit for air force service, may be retained provided that they are fit for the duties of their trade at home and abroad, or at home only, and that their retention in the service will not aggravate their disability. The category of airmen who conform to these standards will be "fit, grade I (general service)," or "fit, grade II (home service only)," respectively, and the existing standard of "fit, general service" will for the present be known as "fit, grade I" in order to avoid confusion with the new standards. No change, other than that of nomenclature, will be made in the existing standard of "fit, general service."

The minimum standard required of airmen applying to extend or to prolong their service, or for continuance in the service, will be "fit, grade II (home service only)." For re-engagement, an airman must be "fit, grade I." The standards laid down will be applied to reservists (other than airman pilots), and similar standards will apply for enlistment or re-engagement in the reserve.

These measures are of a temporary nature and will be reviewed from time to time.

PROPOSED COMING-OF-AGE DINNER OF NO. 13 (ARMY CO-OPERATION) SQUADRON

It is proposed that a coming-of-age dinner for No. 13 (AC) Squadron, R.F.C. and R.A.F., be held on January 31, 1936, in London. All officers who have served in the Squadron are asked to communicate with the Hon. Sec., Coming-of-Age Dinner, No. 13 (AC) Squadron, R.A.F. Station, Old Sarum, as early as possible.

B. J. C. Wise, R.N., Flying Officer, R.A.F., relinquishes his temporary commission on return to Naval Duty (September 17).

Commissioned Engineer Officer

W/O. F. C. Whelman is granted a permanent commission as Flying Officer on probation with effect from November 15 and with seniority of September 19.

Memorandum

The permission granted to Lt. H. V. Albrow to retain his rank is withdrawn on his conviction by the civil power (October 24).

ROYAL AIR FORCE RESERVE

Reserve of Air Force Officers

General Duties Branch

Flt. Lt. F. J. Bailey is transferred from Class A to Class C (November 27); F/O. J. C. Ticehurst is transferred from Class AA (ii) to Class C (October 31) (substituted for the notification in the *Gazette* of October 22); F/O. G. Fitz-G. Atkinson relinquishes his commission on completion of service (October 1); F/O. J. A. Cope resigns his commission (August 26).

SPECIAL RESERVE

General Duties Branch

G. Greaves is granted a commission as Pilot Officer on probation (October 16); Pilot Officer on probation J. C. Reynolds is confirmed in rank (November 1); Pilot Officer on probation M. H. Taylor resigns his commission (October 1); Flying Officer W. S. Gardner relinquishes his commission on appointment to a short service commission in the Royal Air Force (November 13).

AUXILIARY AIR FORCE

General Duties Branch

No. 601 (COUNTY OF LONDON) (FIGHTER) SQUADRON.—S. H. Gilliat is granted a commission as Pilot Officer (October 28).

No. 604 (COUNTY OF MIDDLESEX) (FIGHTER) SQUADRON.—J. W. Charters is granted a commission as Pilot Officer (October 24).

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified:—

General Duties Branch

Squadron Leaders.—J. Cullen, M.B.E., A.F.C., to Headquarters, Coastal Area, Lee-on-the-Solent; for Armament duties vice Sqn. Ldr. P. J. Barnett, M.C., 24.11.35. H. W. L. Saunders, M.C., D.F.C., M.M., to D. of T., Dept. of A.M.P., Air Ministry, vice Sqn. Ldr. W. A. B. Bowen-Buscarlet, D.F.C., 25.11.35.

Flight Lieutenants.—H. A. Evans-Evans, to R.A.F. Station, Pembroke, 25.11.35. G. P. Charles, to No. 84 (B) Squadron, Shaiba, Iraq, 16.11.35. G. W. Tuttle, to No. 5 (Army Co-operation) Squadron, Chaklala, India, 25.10.35.

Flying Officers.—D. I. Coote, to No. 11 Flying Training School, Wittering, 1.10.35. M. A. Payn, to Air Armament School, Eastchurch, 25.11.35. D. R. Evans, to Electrical and Wireless School, Cranwell, 25.11.35. E. M. Lewis, to No. 1 Armament Training Camp, Catfoss, 20.11.35. A. J. W. Geddes, to No. 2 (Army Co-operation) Squadron, Hawkinge, 20.11.35.

Medical Branch

Wing Commanders.—P. T. Rutherford, O.B.E., to No. 1 Flying Training School, Leuchars; for duty as Medical Officer, 22.11.35. T. J. Thomas, to No. 6 Flying Training School, Netheravon; for duty as Medical Officer, 22.11.35.